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POPULAR AVIATION

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"Choose YOUR SCHOOL Carefully" For Success in Aviation

Title of an article appearing in Popular Aviation for January, 1939, by Carl Norcross, Ph.D., New York State Educational Department, Technical Member, Institute of the Aeronautical Sciences. Author of "Getting a Job in Aviation," 1938, McGraw Hill Book Co., Inc.

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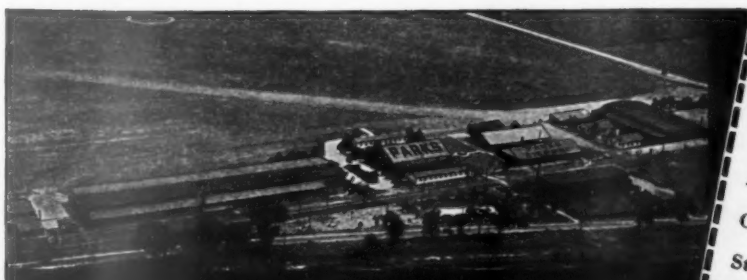

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The Birdmen's Perch

Right now we're wondering if everybody has written for his or her *free* copy of the 5th edition of the Gulf Aviation Atlas. It's a swell big book packed with flying info, maps, charts, pictures, and air history. The supply is getting low, so you better send for yours right away. Write—a penny post card will do—to:

MAJOR AL WILLIAMS, alias "Tattered Wing-Tips,"
Mgr. Gulf Aviation Products, Gulf Bldg., Pittsburgh, Pa.

THE M-M-MYSTERY SHIP

Here's one that was sent us by Ben Martin of Ladysmith, Wis. Thank'ee, Ben!

An international spy (Platinum Blonde

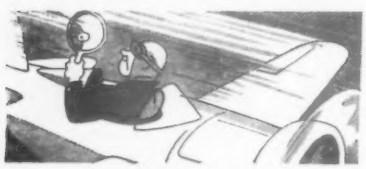
type No. 1) recently unearthed the following data on a new bomber built in a secret factory in one of the Balkan States.

"Model 'X' has a motor 9' long. The fuselage is equal to the sum of the length of the motor and ½ the fuselage. The length of the tail is the motor plus ½ the tail. The whole plane, naturally, is equal to the sum of the motor, tail, and fuselage."

In the general's other pocket she found the following:

"To find the wingspread, multiply the square root of the square root of the length of the plane by the length of the fuselage and add the length of the motor. And the speed may be represented by the sum of those two specifications which, plus one, are equal to another of the specifications plus one squared."

Being a smart girl—although a blonde—she figured out the answers and decided getting the blueprints would not be worth the effort. What do you think? Send in your figures to T.W.T. for checking. Official version by return mail.



DOING IT THE HARD WAY

There are two ways to do everything . . . the easy . . . and the hard.

Take refining our Gulfpride Oil for instance. We could be satisfied with ordinary methods that remove most of the impurities. But instead we use an *extra*, added refining step—the famous Alchlor process. This remarkable process—exclusive with Gulf—digs down so deep into the 100% Pure Pennsylvania that it removes still more dirt, sludge, and carbon-formers. It may be the hard way but, when you think what they can do to a motor . . . boys, it's worth it!

THIS MONTH'S WHOPPER

Dear Major:

Of course we all know about the marvelous qualities of Gulf Aviation Gas when used as a mouthwash. But I claim to be the first to discover that it actually contains vitamins!

Out at our local flying field we have a mascot named Oscar. Oscar is a mosquito. Mind, he isn't one of those pigmy species that live in Florida, Louisiana, and New

Jersey. And which weigh only about five pounds apiece. Oscar is a real *California* mosquito.

We first found Oscar in one of the hangars drinking out of a can of kerosene. He wasn't very husky then but after we adopted him and he got his meals of Gulf Aviation Gas regularly, he really began to *GROW!* (Everything grows in California.)

We sure were proud of Oscar. But soon he got so big his meals presented a serious financial problem. We tried curtailing them but he began attacking the planes and drinking right out of the tanks. At last the boys decided we would have to stop using Gulf Aviation Gas or get rid of Oscar. When the coin flipping was over (it went to 11,111,112 out of 22,222,222) we set a trap for the poor beastie. What we used was a case and a half of dynamite saturated with Gulf Aviation Gas. We attached a long fuse, lit it, and hid to await developments.

Oscar must have suspected something for he kept off a good distance for a while. But finally the aroma of that G.A.G. was too much for him. In he charged and gobbled down that dynamite before you could say "contact!" And no sooner had he swallowed it than it exploded with a roar that could be heard in Zanzibar.

Poor Oscar! I'm telling you, Major, we had a mighty sick mosquito on our hands for a couple of weeks.

Norman McEwan

Gulf Oil Corporation and Gulf Refining Company . . . makers of

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LET'S TALK IT OVER

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Love Field

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YOU fellows who are angry at the Government for "subsidizing" those college students' flight instruction are entitled to an explanation, inasmuch as no one else has taken the trouble. The usual complaint is heard from pilots who already have spent a good deal of their own hard-earned cash to learn to fly. Those individualists have been allowed to build up the impression that Uncle Sam deliberately overlooked them in preference to the college boys. Actually, that's not the truth. The Army Air Corps is frank to admit that they're using this method of lining up prospective pilots. Inasmuch as an important basic requirement for all prospective Air Corpsmen is a two-year college education or its equivalent, the present program naturally has been concentrated on the colleges. Not that all the college lads who make the grade will want to join the Army after they've finished the course; Bill Zewadski (see page 14) thinks he'll stick to private flying.

* * *

THE average American has been doused so thoroughly with scarehead stories about the German air force, it gives him the jitters to hear the subject mentioned. Frankly, even we couldn't keep some of the stuff from penetrating our shell. After all, one picks up his newspaper or a copy of some widely-circulated magazine and sees nothing but the threat of the Hun. Even if we could have withstood that, our radio made up for the rest But the more we thought it over, the more loopholes we found in the "experts" warnings. Queries to certain sources in Washington gave indications of an excellent "other side" to a highly exaggerated story. Within the week John C. A. Watkins was in Washington rounding up some potent facts that apparently have been deliberately ignored for quite some time. Our lead-off article this month is the result. Feel better now?

* * *

IF your hair doesn't stand up after reading Wheels Over Water (page 32) you're probably bald. It's not often you read about what really goes on out there at sea where a tiny aircraft carrier is the only solid spot for hundreds of miles around where a worried pilot can set his tricky fighter down safely. Several of our friends have flown off the carriers.

(*Continued on page* 83)

POPULAR AVIATION

Volume XXIV JUNE, 1939 Number 6

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PA—6

France's air power is being materially strengthened by American Curtis fighters.

French air officers inspect one of the first American-made pursuits delivered.

Above is a fleet of French heavy bombers which will return any attack on France.

CAN THE ALLIES WHIP HITLER'S AIR FORCE?

by JOHN C. A. WATKINS

War threatens the world. Peaceful peoples think the German air force all-powerful. Here are facts that tell a different story.

IF Germany should start a war with England and France tomorrow—and the present critical European situation makes it appear logical that such a conflict might possibly be raging by the time this appears in print—what chance would the Allies have against German bombers?

That question must have been asked thousands of times in recent months by puzzled Americans who have been subjected from all sides to a barrage of articles and editorials describing the alarming impotency of the Franco-British bloc and the equally alarming air power of the Nazi Reich.

Venturing a prediction in a monthly publication—at a time when millions of men, women and children are going to bed each night fearful that dawn will bring an air attack—would be dangerous. But it is possible to present known facts which can throw some light on a difficult situation.

Starting with Germany, it is my intention to present these facts as clearly as possible. They have been gathered from the best possible sources in this country—officials of our own Government, reliable aeronautical engineers who have observed what is going on in fear-ridden Europe, the air attachés of various embassies in Washington, and others whose sources of information cannot be questioned.

The story, to be told properly, must start with the events abroad of about five years ago. At that time the three nations simultaneously arrived at the conclusion that, at about this time they would be engaged in a deadly war. All three began preparing for it, undertaking vast rearmament programs which were to have been completed early last year.

Germany decided very soon that the huge land fortifications which were rising on either side of her border with France would tend to neutralize themselves. That is, in all probability the opposing ground armies would be blocked by the fortifications. For the quick, highly destructive thrust which was—and still is—the Reich's main hope of success, there was only one direction in which to turn. That was to the airplane. It was because Germany did this, and particularly how she did it, that the whole world has been thrown into a turmoil.

Aircraft factories were scattered about in remote sections of the country, each small unit being carefully camouflaged and equipped with gas- and bomb-proof shelters into which the workers could flee through a centrally located ramp at the first air raid signal. To facilitate mass production, the Nazis concentrated primarily on four or five types of airplanes. Their factories were well tooled and equipped—with the result that by the spring of 1938 they were producing

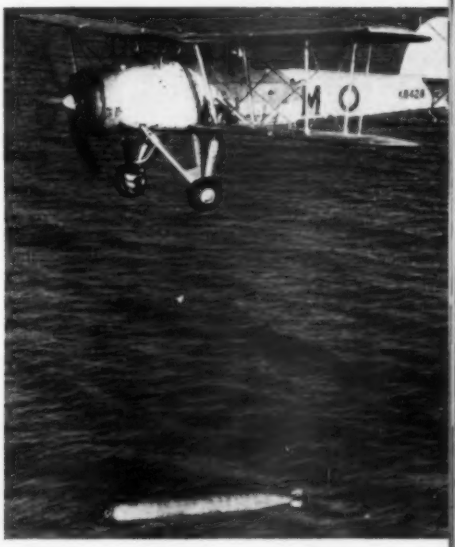
French squadrons are being equipped with this Potez "630."

This is a French-built Morane fighter. Note cannon in propeller.

Prime Minister Chamberlain can back up any answer to threats with sleek British warplanes like these Bristol "Blenheim" bombers. See latest version on page 39.

Factories are turning out these British fighters in great numbers every day.

Britain's sea-war will be carried by carrier-based torpedo planes like these.



Here is a Fairey torpedo plane (also see p. 33) snapped dropping its deadly load.

28 fully equipped combat airplanes every day of a six-day week. When the international situation reached a boiling point in September, the German air force consisted of 9,500 airplanes and sufficient flight and ground personnel to operate them. Production had reached 60 planes a day.

Large and often luxurious schools, comparing in many respects to our technical colleges, were erected in the vicinity of the new aircraft factories. Youths ranging in age from 14 up, who had shown in their preliminary education some aptitude for mechanics, were selected and sent to the schools for a four-year training course. They learned to perform the tasks of skilled craftsmen in many different factory departments, or for assignment to the air force as maintenance men. They lived in barracks, undergoing compulsory athletic training as well as other courses and, at the end of their training period, were assigned either to a factory or to the air force, depending upon the ability they had shown. If they went into the production side they received the prevailing wage in the industry.

Less is known about the means utilized for supplying the pilots to operate the machines, but it may be taken for granted that any program so thorough must have included dozens of flying schools. In addition, it must be remembered that Germany had a backlog of thousands of trained glider pilots to start with—young men who had turned to soaring as a major sport in the years following the World War, when Germany was forbidden to possess power planes.

What was France doing all this time, knowing the extent of the Nazi program? To put it bluntly, the French were in such an incredible mess when hell began to pop last year that it almost defies description. The aircraft factories were taken over by the government, but there was no co-ordination of activities and production began immediately to drop. Dozens of prototypes were produced through a confused program of research and development, with the result that there were many new models being turned out which never reached the production stage.

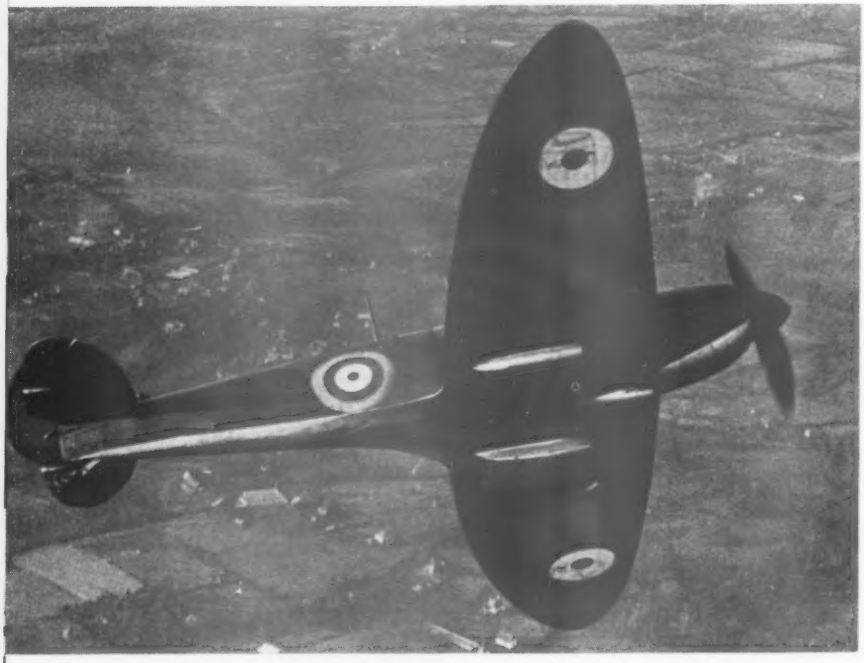
Weeks passed during which not a single plane reached the army. Most of those that did trickle out of the factories—the average rate was one or two a day—were inferior in quality and low in performance. When the Munich crisis came to a head, the French had approximately 1,000 airplanes, such as they were, to pit against the Nazi might.

The situation today is somewhat improved, although still nothing of which France can be proud. The latest information is that about 100 airplanes a

Many British fighter squadrons are equipped with "Hurricanes."

Britain also has many of these Handley Page "Harrow" bombers.

Here is part of Uncle Sam's aid to the Allies. This is one of 200 Lockheed "Hudson" bombers being built in the United States for Britain's mushrooming Royal Air Force.



The performance of the British "Spitfire" is said to surpass that of any fighter in Europe. British factories are turning out hundreds of these and other types.

England is thoroughly prepared for air attack. Thousands of men have been trained in air raid precautions work. The men below are dressed to keep out mustard gas.

month are being produced, and that the government hopes to reach a *maximum* production of 200 a month some time this summer. Think of it! A maximum production of 200 military airplanes a month from all the factories in a nation that has been preparing frantically for war for five years!

Is it any wonder, looking at this record, that England is gravely concerned with the French situation? And how can any American fail to understand, then, why the French are buying hundreds and hundreds of airplanes and engines in the United States?

The outlook across the Channel is far brighter. In fact, Great Britain is the one bright spot in the whole European picture. In the beginning, the situation was rather bad. The British had worked out a program combining private industry with government production. The scheme was intended to enable the private plants to produce as many aircraft as possible without factory expansion, beyond a balancing of departments.

The "shadow plan" of government-owned and operated factories was to be relied upon for mass production in time of emergency. These plants were erected near the major automobile factories, which agreed to supply them with personnel when the need arose. Fully equipped and tooled, the shadow plants were to remain idle until an emergency, when the auto workers were to desert their benches and begin the production of aircraft.

Unfortunately, the plan was not a success. The British learned early in the game that their automobile workers were no more qualified to turn out airplanes than ours were during the World War. Up until early last spring the shadow plants hadn't produced a single airplane, and the approximately 90 airplanes a month which were being delivered to the Royal Air Force all were being turned out in privately-owned plants. In September, the British had some 2,000 ships available for action.

Today, as I said, the situation is much more hopeful. The shadow plants, although operated by the automobile industry, are manned by full-time aircraft workers and the original scheme has been abandoned. Government and private factories together were turning out about 600 airplanes a month last January, and this figure was being stepped up approximately 100 units a month. Today, the British factories should be turning out close to 1,000 combat planes monthly.

Group Captain G. C. Pirie, air attaché of the British Embassy in Washington, told me a few weeks ago that the Royal Air Force now has the situation well in hand.

"We have today in England 1,750 first line aircraft," Captain Pirie said. "That is to say, we have 1,750 bombers and fighters organized in squadrons ready for battle. Behind that we have an undisclosed number of reserve pilots, bombers and fighters adequate to maintain those 1,750 aircraft indefinitely, whatever losses may be encountered, until such time as factory production can

be organized on a wartime basis. In addition to this number of combat aircraft, we maintain some 3,000 training aircraft.

"As far as being 'impotent' against the air menace, the people of Great Britain do not feel that way at all. We have our fighters, bombers, anti-aircraft guns, cannon, machine guns, balloon barrages to defend us actively. . . . Aircraft for aircraft, we consider we have superior performance to any potential enemy, so that we are not in the least alarmed about being bombed or fearful of our inability to reply adequately."

While it is obvious that an official of any government naturally must be publicly optimistic about conditions at home, information available from other sources convinces me that Captain Pirie did not exaggerate in his statement about aircraft available. In addition to the 1,750 airplanes he mentioned as immediately available for battle, it is known that the Royal Air Force has an equal number, together with pilots, to throw into action as a replacement force. Back of this immediate reserve are several thousand more ful'y equipped ships, not to mention hundreds of American Lockheeds and North Americans recently ordered here. Altogether, England must have at least 7,000 or 8,000 first-class fighting planes, with dozens more being produced daily.

During the past year and a half, a number of prominent American aeronautical engineers and manufacturers have spent weeks inspecting production facilities in all three countries. Not days, but weeks. Each of them has come back with substantially the same story, particularly as applied to Germany.

These men are capable of inspecting the equipment of an airplane factory and determining immediately its capacity. They are in a position to know whether its owners are telling the truth or exaggerating. It must be remembered that while some of these men—not all of them—would profit by American fear of Germany's air force, they remain American citizens and their position is such that they would neither desire nor dare attempt to deliberately mislead the people of their own country.

While it is true that anyone making a hurried inspection of a particular plant might be shown a department and told "we put out two ships a day in this department and we have 10 such departments," they are not the sort who would be taken in by so obvious a fraud. Their estimates have been based on what they actually saw, not what they were told existed.

Further, the desperate efforts of the United States Air Corps to build itself up as rapidly as possible, with the complete co-operation of Congress, should convince the layman that there is more to the German menace than propaganda. Governments, including ours, have sources of information not available to the average citizen, and not even a New Deal is going to spend billions of dollars upon arms which contribute absolutely nothing to the economic welfare of the

(*Continued on page 70*)

Pilots who have flown against Germany's Junkers bombers (above) tell of its many vulnerable points in air battle. Some of these "latest" bombers are being exported.

The Messerschmitt is Germany's No. 1 fighter but actually is outclassed by certain older American types. This model also had a mediocre reputation in the Spanish war.

Fleets of German bombers like the Heinkels below can be matched today by the Allies. With the British, French and Russians lined up against Hitler, the outlook changes.

I'm One of the

These are a few of the Government's "test" pilots taking training at the University of Michigan.

The author is a student at the University of Michigan who was among the first to sign up for flight training under the new Government plan. His story undoubtedly is typical of the 330 other college students who already are flying under this program.

I AM one of 330 Government guinea pigs—one of the 330 college students being taught to fly under the Civil Aeronautics Authority's experimental flight training program.

A few weeks ago I had no idea that I ever would learn to fly. Today, as this is written, I have completed seven hours of dual instruction and expect to solo in a few days. By the time this is read, around the middle of May, I will be prepared for the private pilot's written examination and will have nearly 35 hours in my log—or I'll have flunked the course and given up the idea of ever being anything but a passenger in an airplane.

But I don't want to flunk and I don't intend to—and I know the Civil Aeronautics Authority is just as anxious to have me complete the course successfully as I am. Because this is an experiment that is being watched by a lot of important people—including Army and Navy officers, Congress and the taxpayers. Not to mention a lot of fellow students who missed out on this first program and want to get in on the 20,000-pilot program to follow.

Had I ever done any flying before?

No. Down in my home town of Tampa, Fla., I had a scoutmaster once who owned and flew an airplane—a Monocoupe—and he used to take a lot of us young fellows up for hops from the local airport. I was about 13 or 14 years old then and I know I got a big kick out of it. He just flew for the sport of it, as a form of recreation, and I guess ever after that I liked the idea of learning to fly—but that's as far as it went.

I am a great proponent of this program. It is giving me a chance I didn't have before. The $60 they are charging us here at the University of Michigan seems pretty steep to begin with. I don't know just where the $60 went to but I guess it's all right.

(Editor's Note: At the University of Michigan the student fee of $60 covers the insurance required on each candidate, the regular $10 CAA physical examination and transportation between the campus and the airport. In the latter instance, a jitney service operates every hour on the hour from the Student Union to the two nearby airports being used in the program. While the fee may be slightly higher than that charged at some of the other schools, university authorities feel it will no more than cover the costs mentioned above.)

I don't feel that anyone taking advantage of this program has any right to squawk very loud about any part of it they may not like. I can't think of anything very important that any of the fellows have objected to.

My only trouble is that my classroom and study schedule already is pretty heavy—and it takes two hours of my time to get in a half-hour of flying. The extra time is taken up by waiting at one end or the other for the jitney. But this isn't very important, and it probably isn't a difficulty with other students or at other colleges.

The instructors are swell, and exceedingly patient with us fellows. They never fly off the handle, no matter how dumb we may act sometimes, and I think they fully realize how important this whole experiment is and how carefully it must be executed.

I understand that one of the fellows was all ready to solo, but the instructor held him back for a couple of days because he felt the fellow was too cocky about it and didn't have the right mental attitude to solo. That just shows how careful they are being here.

We haven't had an accident of any kind and only one very minor mishap. That was when an engine died during a take-off run and the plane was landed right back on the runway. It was a dual flight.

This flying course should become an important part of the curriculum. Since it got under way here, interest on the campus has increased tremendously. More than half the 20 candidates are aeronautical engineering students and it is helping publicize that department.

I am majoring in patent law and I have some pretty definite ideas about what I want to do with this training when I graduate. But right now it is helping me physically. That may sound strange, but here is how it works.

In the first place, it is taking so much of my time that I don't have any time left for carousing around with some of the other boys on the campus. And, because it requires you to be in such good physical condition, you don't feel much like doing anything that might knock you below par physically.

What will I do about flying after graduation?

Well, I will finish my school work in June. Then I'll have to prepare for bar examinations. There won't be much time immediately for more flying, even if I had the money.

Then I'll go into law practice, prefer-

20,000

by

WILLIAM ZEWADSKI

This is the first-hand story of one of the "guinea pig" pilots in the Government's new flight training program.

★

Bill Zewadski (left) and his flight instructor.

ably in Detroit where there is more chance for a patent lawyer. If I can make any money, I'll keep up my time and buy a little ship if I feel I can afford that, too. My father, who is an attorney in Tampa, wants me to enter his firm and has said he would buy a plane for the two of us, as it will help in the conduct of his law practice throughout that part of Florida. There would be a real use for a plane down there.

In either case, I'd like to own a ship of my own and fully intend to, whenever I feel I can afford it. I don't think it would be a "flivver" plane, though—such as we are learning on. I would prefer something a little roomier, with a little more range and speed.

What about the military aspects of this program?

Of course we all realize that the Army Air Corps is interested in this Civil Aeronautics Authority training — but I don't see that a private pilot's license gets anyone a bit closer to Air Corps service than a person without one. I guess there would have to be a lot of transitional flight training before any of us could handle even an Army trainer, with its higher horsepower and all that.

But I guess anyone with a pilot's license would be called upon in case of war and therefore I feel that such a reserve as is being created by this program is an asset to the country. But if this country ever gets into a war everyone is subject to call, so I guess it doesn't make much difference which branch of the service you get into.

Personally, this training won't make me any more inclined to go to war. It probably will make me more opposed to war itself than I am right now, as I will more fully realize the destructiveness of aerial warfare and the hardship for everyone concerned. Only four or five of the fellows in this program here are in the R.O.T.C.

I think this program and the bigger one to follow will be of immeasurable value to aviation generally. The more that learn to fly, the faster the business will develop; and the more planes bought and flown, the cheaper they will become and the cheaper it will be to operate them.

I think the Government planned this civilian training program for the colleges because it felt that college graduates probably would be in the upper income group and would be better able to continue flying—either in rented ships or in their own planes—after they get into the business world. At least that probably is the theory.

My principal concern is buckling down and seeing to it that I get all I can out of this swell opportunity. And all the other fellows feel the same way about it. There isn't any spirit of competition among us, mostly because the instructors and the university authorities have told us it would do us little good.

Fourteen of our fellows have soloed already, including the few who had had previous flying experience. Five of them had, incidentally, but none held a license. But some of us have run into bad weather or gutty winds on our days, or hours, to fly and nobody expected everyone to solo all at once.

We're all interested in the reports that come in, by way of the CAA, of progress

(*Continued on page 76*)

The University of Michigan's flight instructors, George Downs and John Mathews (second and third from left) had a busy time signing up anxious students wanting to fly.

HIGH FLIGHT

These are the passengers who made the Minneapolis-Boston flight wearing oxygen masks.

by ART RICE

We are getting closer to high-altitude airline flying almost daily. This is the story of one airline's experiment

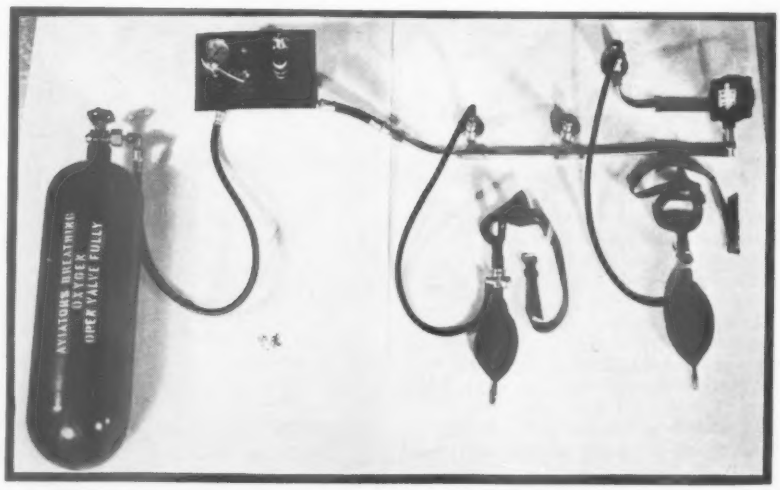
A SILVER transport ship, her two engines purring steadily for 1,140 miles non-stop, dropped out of the clouds at Boston on March 10. At the controls was Captain Mal B. Freeburg, eastern division superintendent of Northwest Airlines. His co-pilot was First Officer Erick Paselk.

In the ship's cabin were nine passengers; a woman and eight men. They had completed the 1,140-mile journey from Minneapolis in four hours and 48 minutes at an average speed of 241 m.p.h.

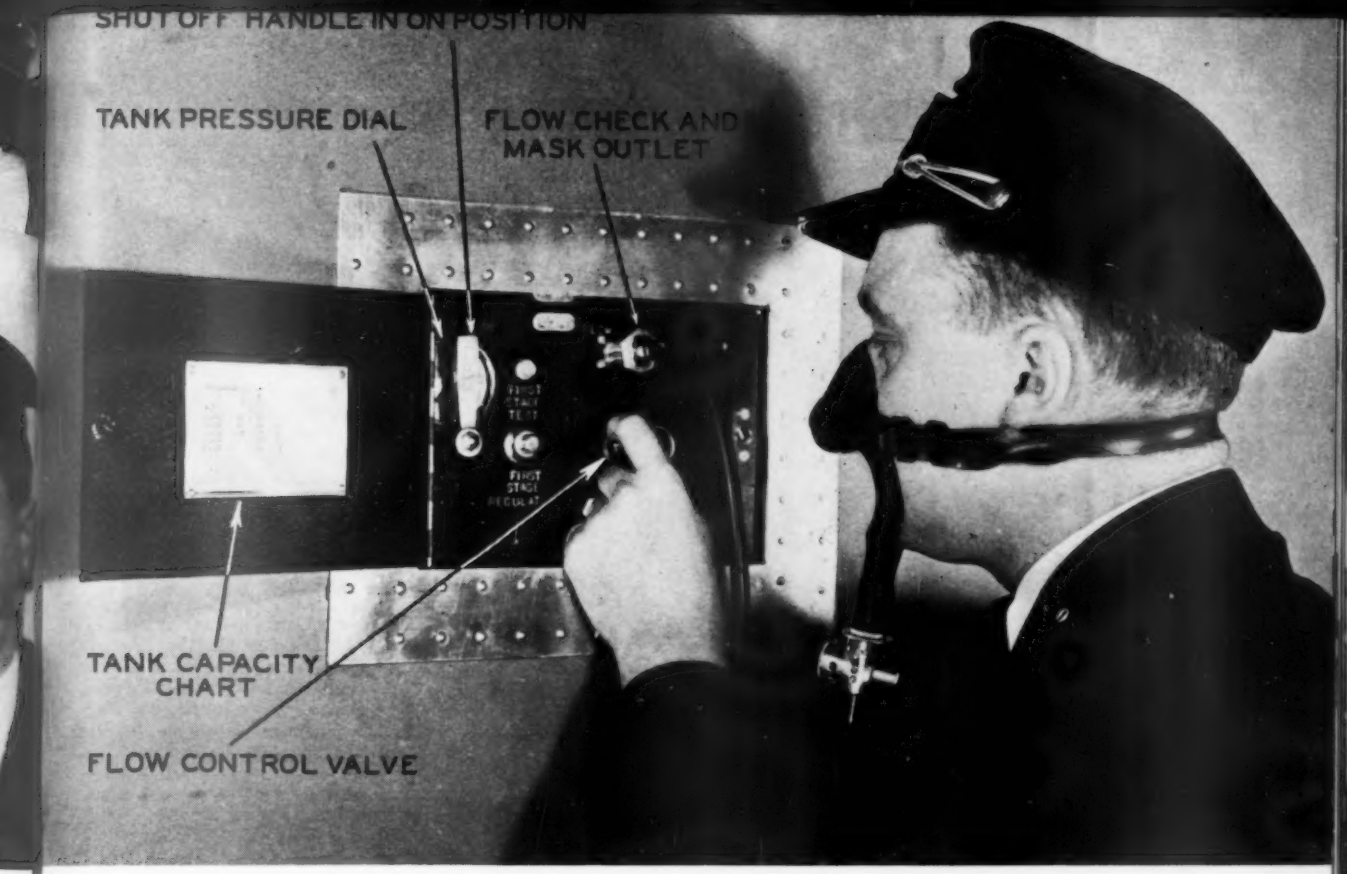
Now transport planes have traveled as far and as fast before. They'll do it again. But this ship sailed along at altitudes of 15,500 to 22,500 feet "over-the-weather" and with no discomfort to crew or passengers. To Mal Freeburg it was "old stuff". It marked his second non-stop, long-distance flight within a year. It was the second time that Freeburg and some of his passengers donned oxygen masks.

These masks were the key to the "sub-stratosphere" flights. Developed by three scientists of the Mayo foundation at Rochester, Minn., the oxygen masks and their apparatus have been adapted by Doctors Walter M. Boothby, W. Randolph Lovelace and A. H. Bulbulian—together with Northwest Airlines engineers—to airline transport use.

Weighing only four ounces, the oxygen masks were worn all of the way from Minneapolis to Boston by the 11 persons aboard the Northwest Airlines Lockheed.



This is a complete layout of equipment on the flight, from tank at left to masks.

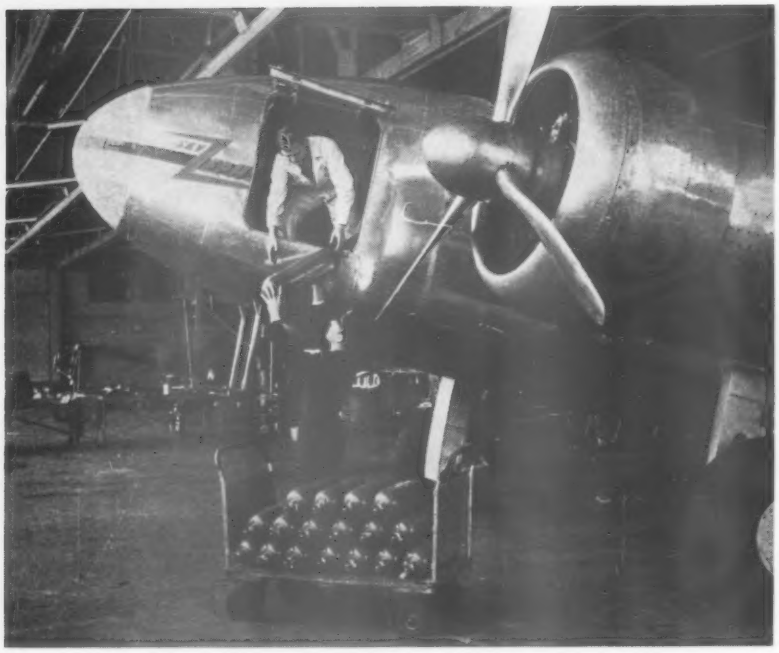


Captain Freeburg (above) is shown adjusting the flow of oxygen on the regulator panel prior to take-off. This regulator is in the plane's lavatory. Below is Dr. W. R. Lovelace, co-designer of the equipment, with the original apparatus first used.

That the mask was of no discomfort was apparent from comments of the wearers upon their arrival at Boston. The lone woman passenger, Mrs. Mal Freeburg, wife of the pilot, told reporters that "we were even able to eat our chicken dinner in comfort. Why, I was even able to powder my nose." But the enthusiastic young woman added, "There's one thing, though: they're going to have to make them more attractive if they expect them to make a hit with the fastidious woman traveler."

The odd appearance of the masks struck a similar note among newspaper and magazine writers in Boston, New York, and Washington, many of whom dubbed the passengers and crew "The Woman and Men from Mars". That fact may make the masks unpopular with some air travelers, but their efficiency has been proved, according to Karl O. Larson, chief engineer of Northwest Airlines.

Aboard the recent Minneapolis-Boston flight Mr. Larson saw the practical success of months of experimentation when his fellow passengers and the crew stepped from the Lockheed at East Boston airport, as fresh in appearance as though they had just been on a 15-minute plane ride over Minneapolis. With Doctors Boothby, Lovelace and Bulbulian, as well as two other Mayo scientists—Doctors J. A. Miller and A. Uehlein—Mr. Larson had checked the reactions of the passengers and crew en route.

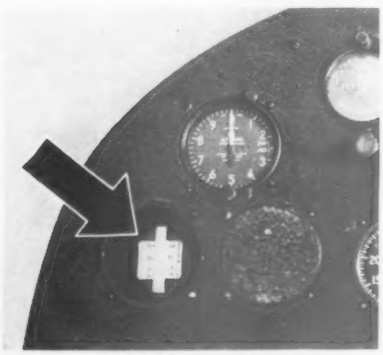


Only a few of these oxygen bottles were needed on the Minneapolis-Boston flight. Each bottle contains oxygen which is confined under 1,500 pounds of pressure.

There were no disturbing incidents on the trip, he said. Conversation and complete enjoyment of the trip was possible. Furthermore the flight proved that the B. L. B. inhalating apparatus (as the oxygen equipment is known) is practical for commercial flying, Mr. Larson believes.

The story of Northwest Airlines' experiments with the Mayo development goes back more than a year. The idea of applying the principles of the Mayo oxygen mask to airline use came to Fred B. Whittemore, former operations manager of the airline.

Prior to Whittemore's death early in 1938, he had watched the development of the oxygen mask with interest. Mr. Whittemore's mother had been ill. Learning that the oxygen apparatus was as efficient as the well-known oxygen tent, he secured a portable unit for his mother. Later, convinced that it was practical, he interested Croil Hunter, president of Northwest, in the work of the Mayo scientists. Hunter became convinced that the idea was practical.



The arrow indicates the flow meter on instrument panel in front of pilot.

Accordingly, after offering the facilities of the airline's engineering department to Doctors Boothby, Lovelace and Bulbulian (hence the name "B. L. B."), Hunter watched the resulting experiments with interest. Chief Engineer Larson and his staff developed valves and tubing with which to pipe the oxygen from containers throughout the fuselage of Northwest's airliners. Their problem was twofold: first, to secure a practical, safe unit; second, to build an airplane unit so compact that its weight would not materially increase the payload of the ship.

After numerous preliminary tests Dr. Lovelace, Captain Freeburg, Test Pilot Mel Swanson, Captain Bert Ritchie (all of Northwest Airlines) and a radio network announcer were ready for a real test of the oxygen equipment. In a Lockheed 14-H (similar to that which was flown to Boston on March 10) this party left Los Angeles on August 15, 1938. A great deal of attention was focused upon this experimental flight. The radio network broadcast at intervals from the plane en route.

As the safety and practical efficiency of the equipment had to be proved at high altitudes, Freeburg nosed the ship high over the clouds. At 31,400 feet he reached the ceiling of the trip. The equipment used for breathing at high altitudes on that flight was very cumbersome compared to the present inhalating apparatus. Large tanks were necessary to accommodate each person aboard; the tanks were large oxygen cylinders, the kind one sees in a welder's shop, and the number of gauges made one's head swim.

But the trip was made safely and the experiment declared a success. Still, the Mayo scientists—Dr. Lovelace especially—were not satisfied. Neither was Chief Engineer Larson, for the cumbersome equipment had meant much added weight to the payload of the ship. Meanwhile, working with the scientists were engineers of the Heidbrink division of the Ohio Chemical company of Minneapolis, manufacturers of the equipment for the Mayo clinic and the airline. These three units of the development squad finally produced what they considered to be a satisfactory oxygen unit early this year.

To make the wearer more comfortable, the mask was designed of a lightweight, pressure-resisting rubber composition. Its total weight is only four ounces. To make the entire unit even lighter, Northwest engineers experimented until a special metal alloy was found, one which would be strong and yet extremely light in weight. Special gauges were designed to handle the pressure of 1,500-1,800 pounds per square inch of oxygen in the storage tank; and a new system of oxygen distribution devised so that instead of it being necessary that a tank for each passenger or crew member be placed aboard, all receiving oxygen aloft could receive it from a single storage tank and a single pipeline system.

That this revised system is practical was first proved by Northwest Airlines when President Hunter invited several Minneapolis and St. Paul reporters to act as "guinea pigs" on a high altitude flight. Pilot Mel Swanson and Co-pilot Tom Chastian climbed the Lockheed until, after a 50-minute climb, the top altitude of that flight was reached—22,400 feet.

All the passengers enthused at the ease with which they breathed normally at the high altitude. To test the difference without a mask, some of them slipped off the apparatus at 20,000 feet. Lips turned blue, breathing was a distinct effort, and dizziness was experienced. It didn't take them long to readjust their masks. Within a few minutes, they reported, normal breathing had returned and reactions were entirely satisfactory.

On February 22 the same ship, with Captain Freeburg at the controls, was flown to Chicago. There, reaching the highest altitude attained by a commercial airliner over Chicago, reporters of that city were flown to 24,000 feet on a flight similar to that made above the Twin Cities. Again, Chief Engineer Larson and Doctor Lovelace reported, the results of the new equipment were satisfactory.

On the March 10 flight the following passengers were aboard: Mrs. Freeburg, Doctors Boothby, Lovelace, Bulbulian, Miller and Uehlein; Chief Engineer Larson; H. T. Lewis of Trans-Canada Airlines, and Ralph Geror, superintendent of Northwest's engine department. The passengers were guests of scientists at a conference on aviation medicine held at Boston by the Harvard University fatigue laboratory on March 10 and 11. At the conference, Doctors Boothby and Lovelace explained the installation.

The ship was flown from Boston to New York a few days later. At New

(*Continued on page* 78)

I LEARNED ABOUT FLYING FROM THAT!—NO. 2

by PAUL MANTZ

This famous airman was pretty sure of himself when he took off for San Francisco. Before that flight ended, though, he had learned an unforgettable lesson.

This is the author, just before taking off for some stunts before the cameras.

Paul Mantz, 35, regarded as one of the nation's outstanding long-distance pilots, is also famous as an aerobat. At present he is president of United Air Services of Burbank, California. He operates the "honeymoon express" for lovelorn Hollywood couples who must fly right to Yuma, Arizona, or Las Vegas, Nevada, without waiting the three days the California law requires; operates a flying school and furnishes planes, equipment and stunts to the movies. You've seen his work in Universal's "Air Mail," MGM's "Test Pilot," Fox's "Tailspin," Paramount's "Men With Wings," and many other productions.

THEORY is all right in a nice, comfortable classroom.

Theory is all right, too, when you're flying on a bright, sunshiny day over the flat fields of Texas. But when the time comes to get out over the California mountains on a cross-country trip of 350 miles from Los Angeles to San Francisco it's a darned good idea to have a little practical knowledge mixed in with your theories. In other words, ground training is swell—but it's also swell to have a dash of that Boy Scout motto, "Be Prepared," thrown in.

The year was 1928. It was spring. I was feeling pretty good about myself and my flying. I was riding in the saddle of a nice, shiny Stearman biplane which I had purchased second-hand from Cliff Durant. I had signed the papers in Los Angeles, had the plane at Metropolitan Airport and I was going to take off for San Francisco which, at that time, was my base of operations.

I was supposed to be a trained pilot. I'd taken my first flying lessons in 1919 and had soloed. I'd been in and out of flying until 1927, when I'd applied for a year's course at the Army Air School at Kelly Field, San Antonio, and had been accepted. I'd been with the Army for the past year.

Yes, I'd had everything from class work to aerobatics, and from military duty to cross-country flying over those nice, flat fields around San Antonio where they don't even know how to spell fog. Nobody could tell me anything.

"Plot a compass course. Fly in a straight line from take-off to destination."

That's what they'd told me out there in the sunshine, so that is what I did. There were a couple of things I didn't think about, didn't bother to ask about. I'll come to those later. They're the things I learned on this day of 1928, when low clouds hung like the bottom of a plate over the San Fernando Valley and I wheeled out the winged chariot to go places.

I poured on the coal, got off the field and went into the soup. Right on up through it to make an over-the-top flight. I had my map all laid out and I swung the ship until it was heading on course. All I needed to do when I got on top was to stick to the compass and I'd be flying right up Market street, San Francisco.

The first rude shock I got was when I came out of the overcast. About half a mile from the point where I broke through a mountain also had broken through. It suddenly occurred to me that the mountain was more permanent than I was, that it would have won an argument with me and that the only reason I hadn't plowed into it while climbing up through the soup was simply that I hadn't headed in that direction. No science, all luck.

I shook off the picture of $8,000 worth of biplane stacked on the mountainside, got my bearings and went onward over the top with less assurance. It was swell, though. It really was. Except that I was getting cold. I was still grabbing altitude, the soup wasn't far below me—and I *had* to stay up there. Because I didn't know where the clouds left off, visibility began and altitude ended. So I hung on for a while.

I was bucking a jolly little headwind. It prevails at that time of year. I didn't know it then, but I know it now. But I stuck with the compass. Until I got too cold.

I went down, down and still down through the muck. Imagine my surprise when I found I was over Coalinga. Just over Coalinga. In fact, hardly over Coalinga at all, if you know what I mean. And Coalinga is surrounded by mountains.

So I went up again. I flew along, getting numb, when I saw a beautiful cumulous cloud on a higher strata. I was tired watching the compass so I checked myself against the cloud. I did some fine navigating, using that cloud as my

(*Continued on page* 85)

UNCLE SAM WANTS A TRAINER

★

by KURT RAND

★

This is a Ryan trainer like that entered in the Army competition.

AERONAUTICAL prescription: take 2,200 additional fledgling pilots for the U. S. Army Air Corps; 20,000 Civil Aeronautics Authority-sponsored neophytes; growing business in lightplanes with South America; and a C. A. A. invitation to build the "foolproof" ship in which a greenhorn can become a solo airman in 17½ hours.

Mix together thoroughly.

Result: an anticipated demand—in the United States and below the Rio Grande—for more than 1,000 primary trainers, less-than-2,000-pound aircraft for beginners, and fly-it-yourself flivverplanes. And the launching of a multimillion dollar business for shrewd aviation industrialists who waste no time clambering aboard the boat, or airship.

By last month manufacturers knew dead-for-certain that the Federal government was ready to commit itself to the project of developing a gigantic reserve of civilian pilots. On their desks, too, lay Army and C. A. A. invitations to participate in the program—to the extent of advancing plans for trainers and aircraft with "built-in safety" features.

Origin of this bustling market for small planes appeared to be twofold. In the first place, at Wright Field in Dayton, Ohio, trials of 17 different breeds of primary training ships recently served as a prelude to the thunderous Army review of America's latest, best ultra-modern bombardment equipment. Many a lightplane was theoretically washed-out at Dayton. Some didn't make the grade because their power plants proved too meager for their heft. Others spun at embarrassing moments. Still others just failed to display the necessary *ooomph* demanded by discerning military inspectors.

Whether any actual orders would be placed for trainers of this kindergarten class—under the whopping Army appropriations bill—remained to be seen. But certain it was that the approved types, those lucky puddlejumpers that passed the spring exams at Dayton, would at least find themselves highly recommended to the Army's auxiliary training schools scattered from the Atlantic to the Pacific. Such a War Department boost would mean plenty of hard dollars in the pants pockets of the makers of the recommended aircraft.

By the same token the market for lightplanes, which hitherto has been pretty well confined to the lucky few students who happened to have $5-an-hour for private flight tutoring, should expand like a hydrogen-balloon next autumn when the C. A. A.'s $10,000,000 dream of 20,000 airmen-a-year starts materializing.

The second phase of this up-and-coming market concerns something so thrilling it makes your head swim. Prosaic as yesterday morning's cornmeal mush, a brief little notice went out to "interested parties" not long ago, inviting their comment and criticism on the C. A. A.'s newest scheme: to cut the present 35-hour minimum flying time for private pilots directly in half. Think of it! Learning to pilot your own ship in the same amount of minutes it takes a transcontinental airliner to cross America from Manhattan to Los Angeles!

C. A. A. men said "they were eager to make whatever contribution they can to get more people into the air and at the same time reduce the present accident ratio in private flying."

Mindful of Germany where 100,000 young men are supposed to be air-schooled, and Russia where parachute jumping replaces hopscotch as kids' play, the C. A. A. appealed to manufacturers for foolproof lightplanes. Its project harked back strangely to the 1934 "safe aircraft" competition of the now-defunct Bureau of Air Commerce. Its aim: "to put a tangible premium on built-in safety in aircraft."

Should such a ship—or ships—be developed, thinks ex-Chairman Edward J. Noble of the C. A. A., a tremendous backlog of adequate airmen might be evolved. Naturally, flyers qualifying in these foolproof ships would be permitted to operate only the type in which they obtained their certificates. But at least

With the Army Air Corps seeking a new training airplane, Wright Field was a bee-hive of activity recently. More than a dozen manufacturers were present.

The Harlow PJC-1 was one of the several interesting types entered in the competition.

they would have the feel of the stick and the taste o' the air—both of which make for eventual aces.

"However," continued the C. A. A. prognosticators, "all grades of pilot certificates would be issued to those trained on inherently safe airplanes in a fraction of the time now required for similar certificates on conventional-type airplanes, provided their flying activities were restricted. . . . "

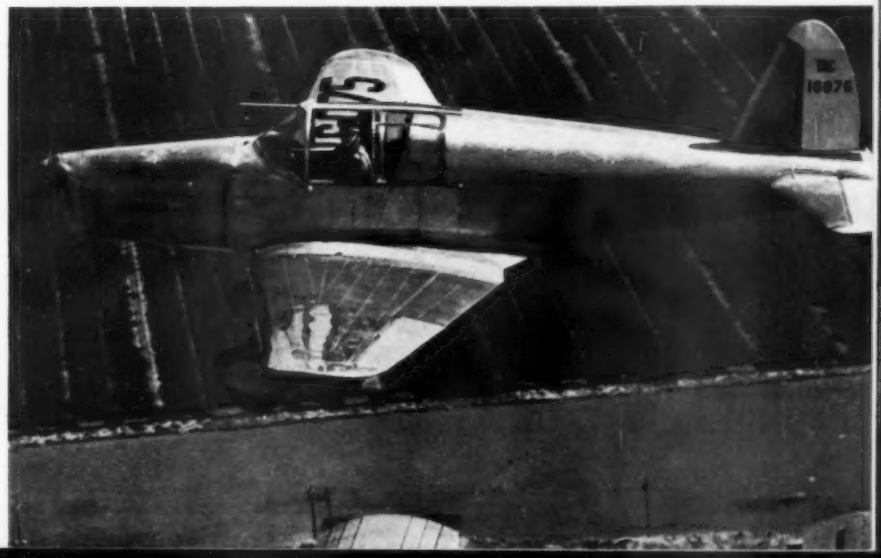
So! By last month this was obvious: that 1940's primary training craft will fall pretty much in a mould; and that 1940's ultra-safe plane is anybody's guess. With a market of upwards of 1,000 planes each year, builders of types conceivably in the primary trainer class embarked on a mad scramble. Into the ring went the hats of Ryan, Phillips, Fleet, Spartan, Rearwin, Cub, Luscombe, Fairchild, Dart, Arrow, Aeronca, Waco, Monocoupe, Fisher, Mercury, St. Louis and Kinner. Some will get the clarion call from the Army. Others, as they do today, will remain most popular on the runways of America's busy commercial flying fields.

Every kid who visits the airport Sundays knows the Aeronca, the Ryan, the *Cub* and all the rest of the popular galaxy. Some of the entrants at Dayton were biplanes, some highwing monoplanes, some low-wingers. For the first time, back at Wright Field, it became apparent that the latter may come into its own as a primary trainer. Among the trial-ships were such craft as Claude Ryan's bumblebee ST model, the Phillips craft that apes big transports with its full-cantilever wing, stressed skin construction and all-metal surface, and the rejuvenated Kinner.

Undoubtedly the old, old argument between the proponents of biplanes and the upholders of the single-winged jobs will arise. It's been the opinion of many that the jump from the Army's Stearman biplanes to the basic monoplane trainers manufactured, for example, by North American, staggers many a fledgling. That'll remain to be seen when the Army announces its Dayton findings.

Meanwhile, the builders are bending into the preliminary phase of getting-ready-for-anything. In Southern California alone, last month, five planemakers boasted possible trainers. They were Ryan at San Diego, Phillips and Timm

The Army competition is one of the bright hopes of the Phillips company, designers of the "Aeroneer". Construction is all-metal, much like that of the large airliners.



The Stearman-Hammond is the type of airplane the C.A.A. has openly come out for. They have asked for a stall-proof, spin-proof design suitable for public consumption.

at Van Nuys, Harlow at Alhambra, and Vega (Lockheed) at Burbank. Naturally, Ryan's already-brisk trade with Guatemala, Honduras, Mexico and Nicaragua gave him somewhat of a head start in this race for riches. But his competitors were ready-and-willing to try for the stakes.

One needn't repeat the Ryan's specifications other than to cite that it's sleek as a cigar, utilizes all-metal monocoque fuselage design, carries thick-gauge Alclad skin over its transverse dural rings. Its wing flaps permit landings in Farmer Jones' cow pasture at Model T speed; in the skies it hits a 160-m.p.h. clip. With a 160-h.p. Menasco, the Ryan can climb to oxygen territory at 21,000 feet—and already has conquered the highest Andes. Its dimensions are typical of what's coming in trainers: wingspan, 29 feet 11 inches; o erall length, 21 feet 5 inches.

Other "miniature transports" will challenge Ryan. Take Max Harlow's plane (originally built as a laboratory project at Pasadena's junior college) and the Phillips *Aeroneer* which enlisted the aid of experts from California Institute of Techno'ogy's Guggenheim Laboratory. Harlow's low winger is slightly larger and somewhat heavier than Ryan's. It has been licensed as a two-, three- or four-seater.

Then, pressing into good use his experience as co-engineer on Howard Hughes' 352 m.p.h. racer, Harlow evolved his PC-5. This will be a trainer and basic combateer for sale primarily to nations where defense and economy must travel hand-in-hand. Because Harlow's PC-5 specifies frugality of operation with a 145 h.p. Warner engine that pulls it at 170 m.p.h. It boasts electrically-operated flaps, retractable landing gear and all-metal construction.

Out at Van Nuys' Metropolitan Airport, a field beloved by Hollywood's air-epic-making producers, Otto and Wa'ly Timm have started pumping adrenalin into the faithful old Kinner Models "K," "B" and Sports. They've engaged Reg Powell, brother-in-law of the late Sir Charles Kingsford-Smith, as plant manager. And they've big plans for the primary trainer market.

Something as different as night from day is abuilding at Burbank, next door to the mushrooming Lockheed factory. Here the Vega division of the latter concern has just put finishing touches on a ship that embodies the Menasco *Unitwin* engine. Two motors hitched side-by-side and geared to one propeller, this device has already won C. A. A. approval as suitable for airline use. So the first $50,000 Vega goes to a midwest transport firm. Later this tricycle-geared craft will be vamped into something more military.

But back to the C. A. A.'s dream of a foolproof flying machine for a moment. Its tentative release to builders asks a ship that:

Will land easily at low speed and will stay on the ground once its wheels touch;

Can be braked to a sudden halt without causing a nose-over;

Exhibits stable landing gear that forbid ground looping and permit facile steering;

Can drop into an airport over a 50-foot obstacle in a straight glide with no wind in 500 feet;

Can taxi easily in any direction under full control in winds up to 30 m.p.h.;

Can't fall off on a wing or spin no matter how inexpertly it's handled;

Won't spin despite overloading, overpowering or reckless aerobatics;

Can be operated with two main (longitudinal and turning) controls that guarantee a minimum of slipping, skidding, or directional trimming;

Allows the pilot unobstructed level view smackdab ahead and latera'ly 90° without his moving in his seat, as well as sufficiently clear view upward, forward, sideward and downward. . . .

Now, the C. A. A. reasons, when such a plane has been built, you'll really have something—and you will. For, with official Federal blessing, it appears logical that a manufacturer might make a tidy living selling flivvercraft to folks who've always wanted to fly but couldn't afford to struggle through the expensive training period attendant on obtaining a governmental certificate of competency.

Some builders think they already have such a craft. One is Waldo Waterman, veteran planemaker whose *Arrowbile* won one of the Bureau's awards in 1934 as a safe plane. Last month, encouraged by the C. A. A.'s feeler, Waldo hastened to improve further on his unique, V-winged, tricycle-geared, tailless machine. He will simplify his removable-wing principle to reduce cost and allow a fixed pinion.

Then, too, there's the Stearman-Hammond in which many an aviation writer with more literary ability than aeronautical skill has received his baptism of sky thrills. The S-H advertises its anyone-can-fly-me characteristics, offers its controls to anybody who can drive a motorcar.

But whether such craft as this pair will become tomorrow's flying flivver, nobody knows. Perhaps in a barn in Kalamazoo a bright young man is at this very moment screwing the last bolt in place in the machine that will bring him fame, fortune and a Henry Ford reputation.

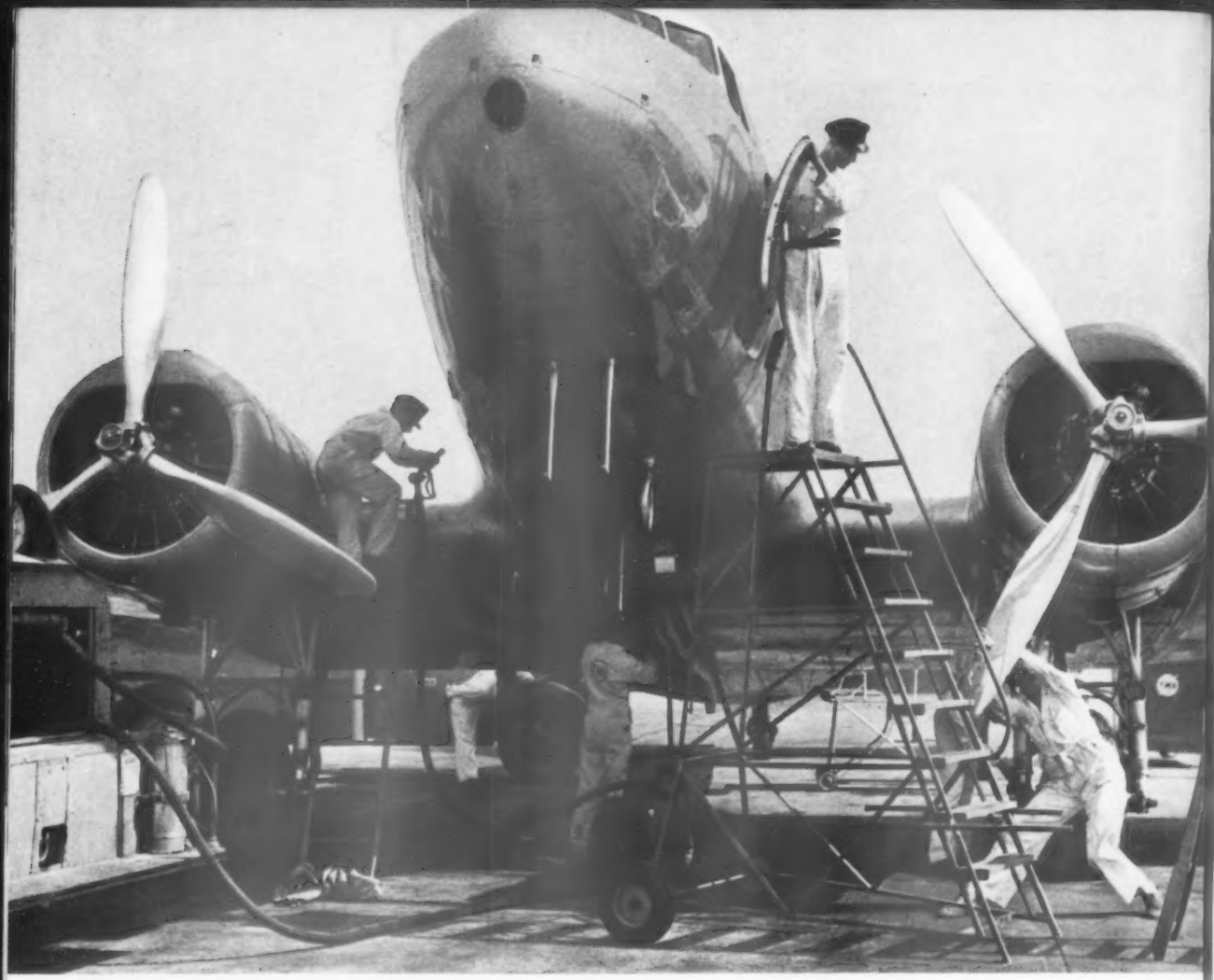
Who knows?

END

Waldo Waterman thinks he has the answer to the C A.A. request for the "super-safe" plane. The wings of his "Arrowbile" are detachable and can be hung up in a garage.

MITE TO MIGHT

Several months ago we published the photograph of Glenn L. Martin's flying model at left. Recently, the reason for this model became apparent with the appearance of the above patrol boat.



On the mechanic depends much of the success of an airliner's journey.

One of the duties of the apprentice mechanic is the refuelling of airliners.

So you want to be an AIRLINE MECHANIC

by MADISON I. SELIGER

To the airline, the man on the ground is as important as the pilot. Here is the story of the "grease monkey".

From his own garage in Columbus, Ohio, (his home town), the author went to the now-extinct Kreider-Reisner airplane company at Hagerstown, Maryland, as a mechanic in the firm's experimental department. In 1930 he returned to Columbus as a TWA mechanic, was transferred to Newark in 1931 as a crew chief. In 1936 TWA made Mr. Seliger its maintenance foreman in Newark and, in 1937, transferred him to Chicago where he is today in the same capacity.

Full-fledged mechanics, apprentice mechanics and helpers all take over an airliner at the end of its run. Every vital part is certified before the ship can be flown again.

WHAT are your chances of getting a job on one of the nation's major airlines? That depends largely on you—your inclination toward mechanical things and your willingness to study and work. If you are the right type and you persevere, you'll probably find an opening on an airline.

In spite of the recent stimulations to aviation as a career, inspired largely by the Government's plan to train approximately 20,000 pilots a year, there are thousands of young men who realize that not everyone is fitted to become a pilot. They know, too, that the way to a pilot's job on an airline is a long, hard road that only the few with exceptional qualifications can travel.

For instance, they have found that before joining an airline as a pilot there are the usual preliminary requirements of at least two years of college, acceptance by the Army, Navy, Marine or a private training school; long weeks of study and training and stiff examinations as important hurdles —and finally the opportunity to join an airline as a co-pilot. Even after all this experience and training, the young co-pilot must look ahead to at least four or five years on the right side of the cockpit as a First Officer before he builds up enough seniority and experience to move over into the left, or Captain's, side of the pilot's compartment of a transcontinental airliner.

Between the hazy idea of "I'd like to be an airline pilot," the determination to learn to fly and the goal of the pilot's seat of a giant Douglas transport are years of study, training and exceptional abilities. Besides countless hurdles of training, there are physical and educational limitations that may prevent fulfillment of this ambition.

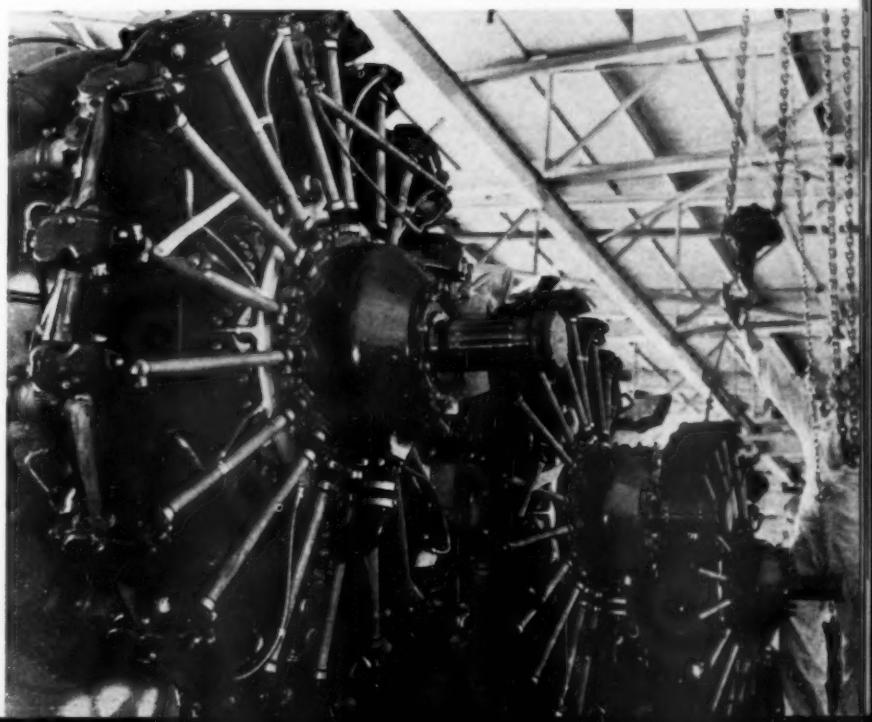
The young man who realizes that, for every pilot flying an airliner there are 40 men in ground jobs on an airline knows that, if qualified, his chances of finding a place in commercial aviation are far better in a ground job. These young men know that, because of their particular aptitudes, they probably can become good mechanics. As such, their chances of realizing the goal of an airline job are far greater than shooting at the limited job of piloting.

While the way into an airline mechanic's job is no bed of roses, it is, of course, a great deal less complicated than that of an airline pilot. First of all, the young man who aims at getting a job as an airline mechanic should have an overwhelming desire for mechanical work. You alone know whether you are fitted for mechanical work. You should be the kind who *likes* this type of work best of all. We assume you are that type or you wouldn't be interested in this kind of a job. If you'd rather not get your hands dirty, or if you'd prefer to have a white collar job behind some counter or a job in father's office—it would be well to forget the airline mechanic's job. Don't just aspire for this job to have a job. It's a position that requires hard work, painstaking effort, application, study and constant experience and practice. It's a job that has no greater importance in the whole airline field. No airline can be any better than its maintenance crews and pilots.

Right at the beginning you would probably like to know about qualifications for the job. First of all, present day educational qualifications are quite elastic. Education programs that have been aimed at this kind of a job ought to be helpful to the newcomer in making his application when the job opening occurs. However, educational qualifications alone are by no means the only things considered.

While I'd say that about 90 percent of the new maintenance employees joining TWA have had training in C. A. A.-approved aviation schools or in types of schools and colleges offering aeronautical courses to those ambitious to enter aviation as a profession, this qualification is not

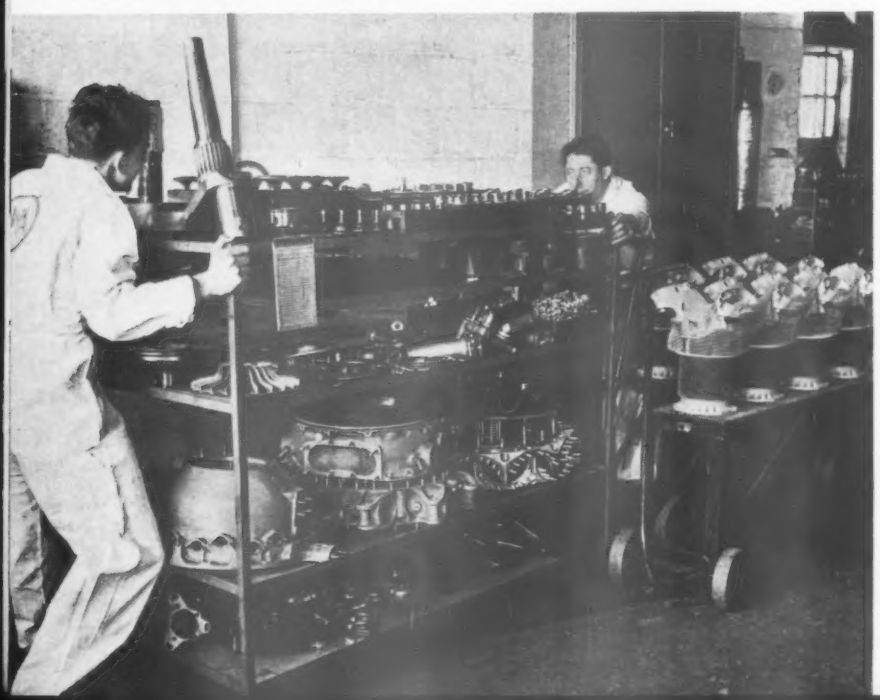
Periodically, whether they need it or not, engines are taken out of airliners and completely overhauled. More than 3,000 h.p. are represented in this photograph.



Propellers are periodically checked with great care. After a certain period of actual use propellers, like the engines, are completely dismantled. Worn parts are replaced.

This mechanic has just replaced a worn inner tube in a TWA airliner's landing gear.

This is a 1,220 h.p. engine dismantled into 1,300 separate parts. Every part of this engine will be minutely examined before it is rebuilt and test-run many hours.



21-passenger airliners, together with the various kinds of work involved on these large transports, requires great skill and is far different from working on small private craft or motors with low horsepower. The job of the airline mechanic is a real profession in itself—far different from the well-known job of garage mechanic or the aviation mechanic who works on small private type planes. No matter if the new airline employee has a C. A. A. airplane and engine mechanic's certificate of competency when he joins the company; it's a long hard pull to the rank of a first class mechanic. Now let us see what the steps are in getting a job on an airline.

First, the young man of known mechanical turn of mind has decided that he will not be satisfied in any other calling than that of an airplane mechanic. He has gone to high school and perhaps an aviation school and taken mechanical courses, besides the three "R's" and liberal arts that are available to him in those schools. Perhaps he has finished a technical high school course before enrolling in a school or college that specializes in aviation.

By this time he probably has his eye on the airline for which he hopes to work. He has without a doubt visited the hangar or shops of this airline and had a talk with other mechanics, crew chiefs, or perhaps even the maintenance foreman. Perhaps he has already filled out an application for a job and maybe has had a preliminary interview with one of the airline's supervisory officials.

Applications from ambitious young men are continually being received by Transcontinental & Western Air, Inc., at its many stations from coast to coast. Those applicants, believed from preliminary interviews to have the best possibilities, are often sent to the company's main base at Kansas City, Mo., for interviews with L. M. Reed, TWA director of personnel.

After a physical examination and further interviews with maintenance and operations departments officials, the applicant goes to school. Here at the main base he receives preliminary training and is given an idea of the company's policies on operations and maintenance with special reference to his immediate duties. As an opening develops he is transferred to one of the 19 stations on TWA's route.

That all may sound quite simple. But getting a job as a mechanic isn't quite as simple as all that. When the young man accepted by the personnel board has received instruction for a period of several weeks at Kansas City headquarters and subsequently has been assigned to a definite station, his first job is far different than that of mechanic. He starts in at the bottom of the maintenance department ladder—as a "cleaner."

The cleaners are those men in white uniforms who, in a squad, descend on the huge transports armed with supplies, clean linen, dust cloths, vacuum cleaners and even eight-foot-long scrub brushes. They wield the long handled brushes in washing the Douglases from nose to tail with soap and water. They are the ones who perform the tasks of washing every window in the plane, inside and out, emptying ash trays, straightening magazine racks

a rigid requirement at present. One of the main requirements is that the young man be interested in aviation mechanics. By that I mean that he be interested in mechanical work above all other kinds.

For instance, I've seen boys right off the farm who had mechanical tendencies develop into first-class mechanics. Possessing native intelligence and combining this with experience and practical instruction through working on the job, they have come up through the ranks under proper supervision and turned out to be some of the best mechanics in the country. Theory and laboratory instruction in schools provide a wonderful background for the embryo mechanic but nothing takes the place of hard work, careful application and years of practical work under competent inspectors in turning out the A-number-one airline mechanic.

It must be remembered that working on high-powered Wright *Cyclone* engines and

and a hundred and one other tasks that all are important in airline operation.

But don't get the idea that the fellows on the cleaning squad consider it a menial task. In the aviation industry every cleaner knows that he is serving his first apprenticeship on a job that leads to the position of airline mechanic. The cleaners assist mechanics in servicing the through planes on the transcontinental flights. While the cleaners cannot have any active part in performing work that is in the slightest degree "mechanical," they see to it, in the 10 or 15 minutes that a plane is on the ground, that the interior is in spotless condition and that all provisions are replenished.

In spare moments, the cleaners become expert "shoulder-leaner-overs." They watch the mechanics and crew chiefs inspect and repair the sensitive flight instruments, radio equipment and engines. After a year (and sometimes two) if no vacancies occur earlier, the cleaner may advance a step further. This is the position of Apprentice Mechanic, Class C. Even now he is not permitted to make any repairs but acts as helper to the Class B and Class A apprentice mechanics. He serves directly under these men but also is allowed to be a helper to the crew chiefs and inspectors in the final checking over of the planes.

The airline mechanic advances through two more stages of apprenticeship—Class B and Class A. When he has completed his apprenticeship he still is quite a long way from his goal. There are two more hurdles to overcome. First, he must pass a rigid examination given by inspectors of the Civil Aeronautics Authority. Secondly, there is the other bogie—there must be a vacancy into which he can fit.

Perhaps it would be a good idea to give some sort of an idea as to what type of subjects are covered in the C. A. A. examinations. A wide range of subjects is covered, testing pretty thoroughly the prospective mechanic's general knowledge of all the important branches of the work he will be expected to perform. Here is a tip from Capt. Ora Young, senior aeronautical inspector of the Third Region of the Civil Aeronautics Authority with headquarters in Chicago:

One of the main causes for failure in the examinations is not primarily lack of knowledge, but unfamiliarity with Civil Aeronautics Authority regulations. Experience has shown that the applicant who has made a study of the Civil Aeronautics regulations has a far greater chance of making a good grade on the written examinations than the others—no matter how much experience they have had.

"In the majority of instances applicants who fail," Captain Young said, "do so because they do not know the regulations and therefore are not familiar with the limitations set up for their work. These are clearly outlined in the Civil Aeronautics Authority regulations maintenance manual and should be studied and digested thoroughly."

Of course, all examinations are different but to give a general idea of the type of subjects covered, here are some given in past examinations. These examinations are divided into two divisions—aircraft mechanic's examination and aircraft *engine* mechanic's examination. The subjects covered, as you will see, are radically different.

This man holds the highest Government rating of "airplane engine mechanic".

This mechanic is repairing a fuel line outlet on a Douglas airliner's gas tank.

Here are some typical questions asked in the aircraft mechanic's examination:

"Define, tell the purpose of, and the procedure to accomplish, each of the following: annealing, tempering, heat treating, quenching and case hardening?"

"What practices are prohibited in the maintenance and repair of aluminum alloy structures?"

"What are the regulations governing: (a) wires and cables; (b) repairs to metal ribs and spars; (c) repairs to heat treated members; (d) rosette welds; (e) fuel line installation and maintenance?"

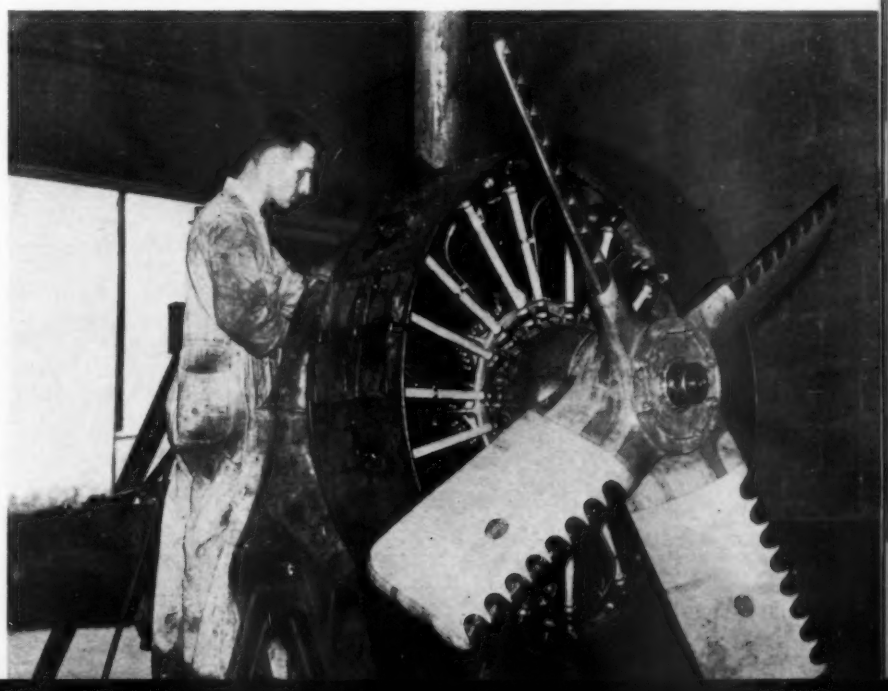
—or—

"Give six grounds for the suspension or revocation of an Aircraft Airworthiness Certificate. For what reasons are they automatically suspended?"

(*Continued on page* 68)

Engine parts are bathed in a solution to remove grease and dirt, then are inspected.

After a major overhaul, every engine is run many hours on the airline's test block before installing in an airliner. This mechanic is checking after full-throttle test.



NIGHT MISSION

by LIEUT. FRANK ARMSTRONG

Last month you were introduced to attack aviation. Here an attack pilot takes you behind the scenes for a hair-raising tale.

THE Thirteenth Attack Squadron, Barksdale Field, Louisiana, had moved out 25 A-17A attack planes and were in at Langley Field, Virginia, after a flight of approximately seven hours. The squadron commander of the Thirteenth had received all of the pertinent information and his operation officer was fully aware of the importance of what was to follow. One thing remained to be done: complete an attack mission through the alarm net—at night.

Attack aviation is wholly dependent upon low flying for protection as well as deception, both day and night. The altitude along the route "in" varies from 3,000 feet to tree-top flying. Daylight missions are comparatively easy to navigate. However, low altitude night missions are entirely different. Check points do not loom up through the night haze. Ground fog forms in the lowlands and covers the prominent places you have

Lieutenant Armstrong, the author, in the cockpit of his A-17A attack plane.

spotted on your map. Rivers are crooked where they should be straight and areas are flooded where they should be dry. Fog plays hide and seek with the pilot when he least expects it. Villages with lights twinkling at you with a thousand eyes anticipate your anxiety and change form. Long artificial arms stretch out across the ground in an effort to lead you astray. The horizon dips below the trees and competes with the blackness of the night to force you up for altitude and a better view. Familiar landmarks are under you and away—sometimes you recognize them too late. Often they have been missed entirely. . . .

The orderly opens the day-room door and pages the "A" flight commander. The night mission is on and I am to lead it. I start for the hangar. The distance is short but my thoughts carry me miles ahead. What will be the forecast for weather at take-off time? Will the fog roll in before I return and close

The author's squadron—the Thirteenth Attack—on routine flight maneuvers.

Langley in? What is the wind along the Atlantic coast and what are conditions around Cape Hatteras? She is boiling tonight I am sure. I wonder what the visibility is going to be across Dismal Swamp. Albemarle Sound is larger than I thought, and it will be like the inside of a cow tonight—dark. I will know the answer to all of those questions before the night has passed. Maybe I will know the answer to other questions too. Who knows?

The data is posted for me. I open my map case and select the proper maps for the area to be covered. The correct compass courses are checked and jotted down opposite an arrow-like mark. Each time of arrival at predetermined points is calculated and ended with the estimated time of arrival at the objective. Forty-five seconds is the maximum time allowed off the target, wether it is 40 or 400 miles distance. Bends in prominent rivers, bridges and highways are studied. Railroads are traced to and from large towns. The relative positions of towns along the course are remembered. The maps are folded and put away.

The sun is sinking rapidly below the horizon as the nine assigned pilots assemble in the operations office at 6:15 p.m. Youngsters, all of them. Maps are fluttering like a curtain in a drafty window as they are folded and unfolded so that a last minute checkup can be made. A quick whisper here and a jerk of the head there make it evident that lengthy conversations are not desired. Quiet suddenly reigns. A message from the control tower. Fog is predicted too near our time of landing for comfort. Night fog over a strange field with nine airplanes and a limited supply of fuel. Fog that causes the wing lights to blur and fade out to a distant glow. Weather that makes your wing men tuck their wings inside your stabilizer and "sit" with you, sticking to you tighter than a wet silk shirt. The silence is suddenly broken with "Oh, Hell! Let 'er roll" and the activity of a few seconds ago is resumed. Anticipation and expectation become intermingled as the time of take-off approaches. Crowding nearer and nearer, closer and closer together, ever anxious not to miss that one charmed word: Stations, 6:40!

Station is the term used to designate the time each pilot will be in the cockpit with his motor turning over, ready for the taxi-out signal.

I pick up my map case and walk out into the darkness. The cockpit is reached by stepping up from the ground to the low wing and then to the cockpit. My crew chief pulls the straps of my parachute over my shoulders. At the same time he informs me that the engine run-up had been made on the right center tank. I close the cage and engage the starter clutch with my toe. After the desired turnover of the starter is reached, my heel goes down and the engine begins to growl with power. Navigation lights are turned on. The "T" lights on the stabilizer and fuselage tone down. Rapidly I switch my gas gauge indicator from one tank to another, at the same time cutting in my radio. Time is moving along swiftly and many things remain to be done. The crackle in my earphones tells me that my radio receiver is functioning properly. Tonight there is to be radio silence, so the transmitter is not tested. Quickly my eyes roam from one instrument to another, checking each one accurately.

The clock on the dash has ticked away three minutes since I first entered the cockpit. Two minutes to go! Wing lights on and off down the line of ships, a visual signal that everyone is ready. One minute to go! Motors begin to blow long blue flames from the exhaust silencers. Switches are tested. Chocks are pulled from their places in front of the wheels

Attack aviation is wholly dependent upon low flying for protection as well as deception, both day and night. The altitude along the route "in" varies from 3,000 feet to tree-top flying, all hazardous.

The Douglas (Northrop) A-17A attack plane has been standard in the Army Air Corps for several years.

and brakes are released. A move of the crew chief's hand signifies that all is clear. Slowly I begin to taxi out to our assigned runway. Green and red wing lights begin to move up. The green lights are counted at I turn the nose of my ship on the ramp. Fifteen second to go! My two wingmen move into position for a three-ship element take-off. The long hand of the airplane clock reaches the designated time—6:45—as three low-wing monoplanes begin to move slowly down the runway. Slowly at first, but not for long. Speed begins to build up and runway lights pass faster and faster to the rear. A quick glance at my wingmen assures me they are all right. The lights begin to drop down and back. The first element is off. Immediately the instruments are checked; wheels are being retracted. The propeller pitch is changed to cruising. A glance outside in an effort to locate a ground reference point; there is none as we are over water. The first turn is made on instruments and the field below is sighted. Slowly we climb and turn as the second element leaves the ground. A few seconds later the third element begins the take-off. Eight hundred feet and we are over the field climbing for our alloted altitude of 1,500 feet. The second element is climbing rapidly and closing in. One more turn and the third element moves up into position and seems to stop.

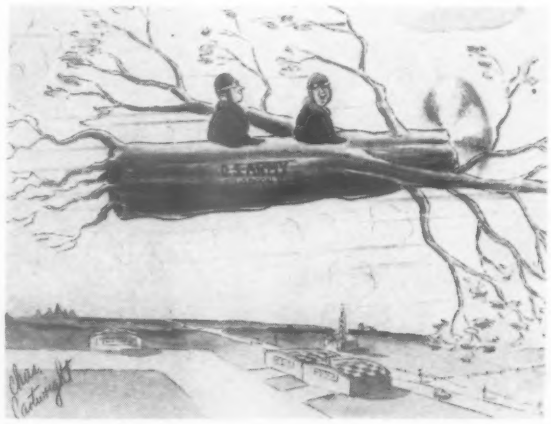
Altitude: 1,500 feet. Position: Fox Hill. Time: 6:49.

A dip of the wing and the two following elements move over to the opposite side. The moon is just above a cloud bank to our left and is casting a glare on the metal fuselage. Eyes will be tired enough before we land and the bright reflections is to be avoided. I turn on my cockpit lights and jot down the time and altitude over Fox Hill. The wind is brisk over Chesapeake Bay and the whitecaps below are dancing about rapidly. Lights are turned down, rudder pedals adjusted and cockpit heater turned on. Time and compass course check as correct, a'titude as prescribed and nine attack airplanes in formation. The flight is on!

I lower my seat so I can turn and look at my gunner. His cockpit lights are on and he is reading. I wonder what his reaction would be if the motor coughed at him while we are over the long stretch of water. There would be no logical reason to jump as there is not a boat in sight. Then too, the strong wind would drift him out to sea. Would he elect to ride her down as I attempted to make a flare landing on the water—and wait and hope? I should cut the switch for a second and snap him out of his repose. What would *I* do in an emergency? The shore line is forming under the nose of my plane now and I do not have to answer by own question. On the next flight I will figure that one out—if I think of it and have time.

The moon has gone and it is really dark. There is no sky line. I lower my seat a notch and go on instruments. Time, speed, and altitude all are important to me. My next check point should be coming up in a few minutes. I watch the clock and peer out into the darkness looking for a lighthouse that should be near. The minute hand is racing with me. I must hit this check point on time so I can change my course. Am I going to miss it and go out to sea? A sudden flash skirts the low ceiling and is gone. Again I watch for it and it repeats. The light I have been looking for has flashed and gone under the low clouds.

Time, altitude, and a new compass course are noted quickly. My wing lights begin to glow and the other elements seem to be in the distance suddenly. I have flown into a cloud bank. Rapidly I rock my wings to close up the formation. My signal was not needed for already a red and a green light from my wing men is shining in my cockpit. The other two elements are hovering just above us and to the side. I am glad it is not rough tonight. My No. 2 pilot would poke me in the ribs with the slightest bump. It is getting darker now; long white veils are slipping by and water is splashing down the windshield. My r.p.m. begins to drop slowly. Automatically I reach for the carburetor heat control handle and pull it full on. The motor jumps and a short flame spurts out. The ice has been belched out and I am back to cruising again.



"Y'know, you've certainly got to hand it to those camouflage artists . . ."

Twenty-nine minutes have passed. One minute and thirty seconds to my next point and a new compass course. I'd better stay on instruments and stop looking in and out of the cockpit. There isn't anything to see beyond the wing lights of my formation. Time drags. One star leaps through the haze at me. Two—a dozen—thousands of them. We are in the clear again as quickly as we went out of it. I relax and fishtail my ship. The wingmen and elements slide out to a breathing position. The deserve it after 30 minutes blind and in tight formation.

Check point No. 3 noted. Altitude checked. Time: two minutes late.

I swing to my new course and click my "gyro" on zero. This is the life; stars and a new moon overhead while our shadows dance on the quiet water of Currituck Sound below. The maps are tucked under my left leg while I light a cigarette I have been thinking of for many minutes.

I check my compass and again set my gyro. My eyes pass from one instrument to another and finally stop with a lurch on the cylinder head temperature gauge. It is too high and going up. The lights are turned up in the cockpit and the heat control handle is pointing at me. I forgot to take it off the carburetor when we came out in the clear. Adjusting my belt and checking the instruments brought me to that ever moving hand on the clock. Four minutes to go and I will be in the "Net". Rocking my wings lazily I watch the formation close up once again. Not for the same reason it did before and I am glad. We are over the "area' now. Lights out! I flick my navigating lights on and off and watch the others fade out entirely. The formation is black now, each ship, each element silhouetted against the sky. We are losing altitude rapidly now. Low flying to the objective and the race against time is in full swing. Mixture controls are jockeyed back and forth until the exhaust flame is nearly extinct.

I look down for a check point and find Albermarle Sound a mirror with the lights of Edenton shooting out in spear-like forms across the water. I change my course and ease the throttle forward. The two minutes lost on the second leg must be made up. Time and speed must be accurate over all of my check points if the objective is to be arrived at on time. The area over which we are flying is alive with "lookouts" and they are spotting us with clocklike precision. Williamston is slipping under my wing. Roanoke River, the home of shad fish and swirling currents, glistens through the tall cypress and water oaks.

My No. 2 man is in trouble. He is swaying from side to side and losing altitude. His exhaust is shooting flames back to the tail section, long red tongues. Slowly but surely he is going down under me. I should call him. Maybe we will call me. Damn radio silence! The cage of my cockpit is back and I am looking for him. He should hit soon. Fool! Pull a flare and leave it. I see him now, skimming the tree tops. I had better pull out before I dive into the ground trying to follow him down. Thank God! He is climbing again for his position. My heart is bumping my ribs as he wags his wings, the signal that all is well; and takes up his position in formation.

Greenville, Kinston and Warsaw pass with clock-like precision. The "initial

(*Continued on page* 84)

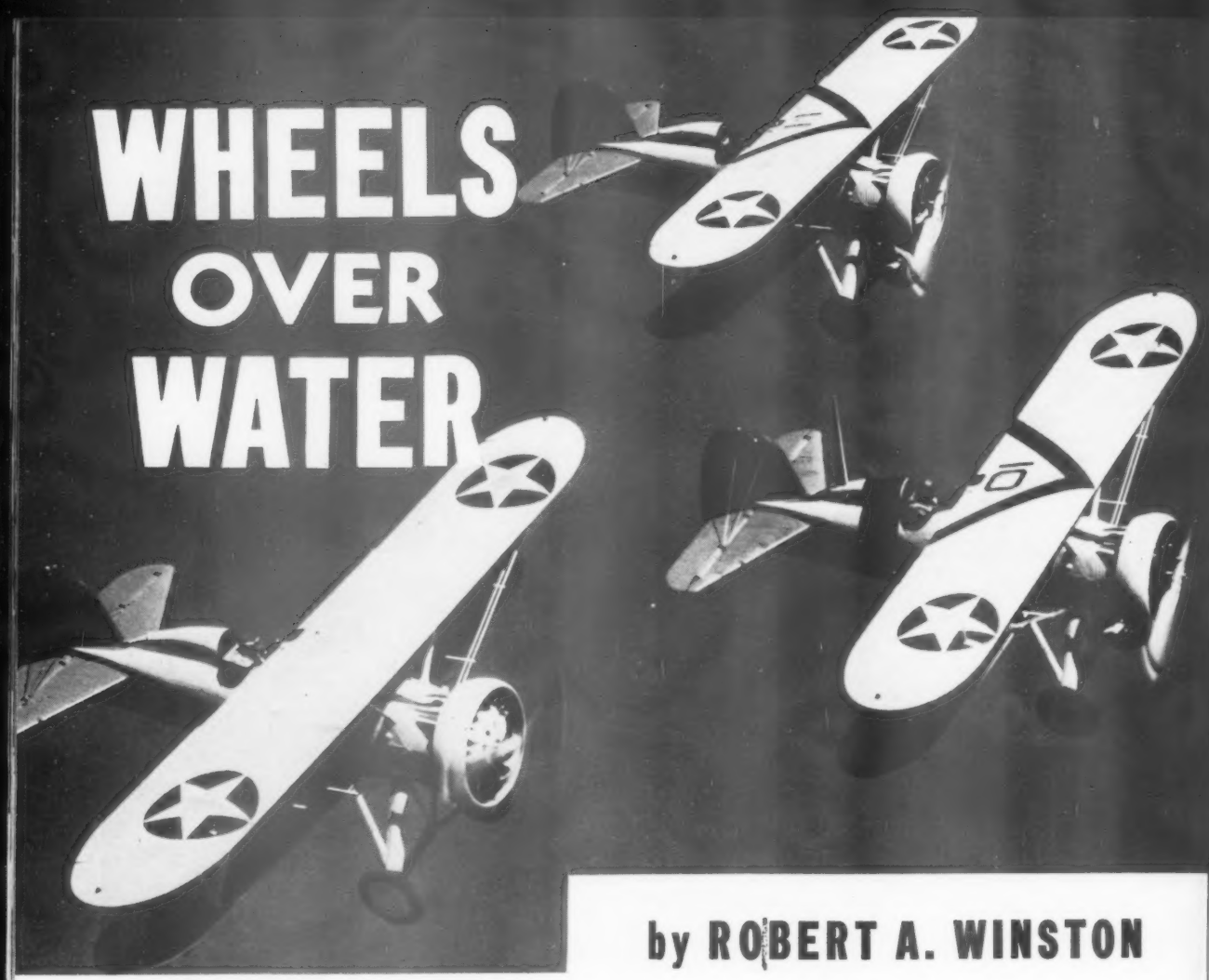
HOOKED MAIL!

THERE will be a full-fledged rural air mail service—the first in the history of American aviation—starting May 12, a day or two after this issue appears on the newsstands. Two routes have been set up and approved by the Post Office Department: Air Mail Routes 1001 and 1002. The pioneer company holding those highly significant contracts is All-American Aviation, Inc., a Delaware concern headed by wealthy Richard C. duPont, prominent sportsman pilot and soaring enthusiast. The man really responsible for the whole physical system, however, is Dr. Lytle S. Adams, inventor of the pickup device.

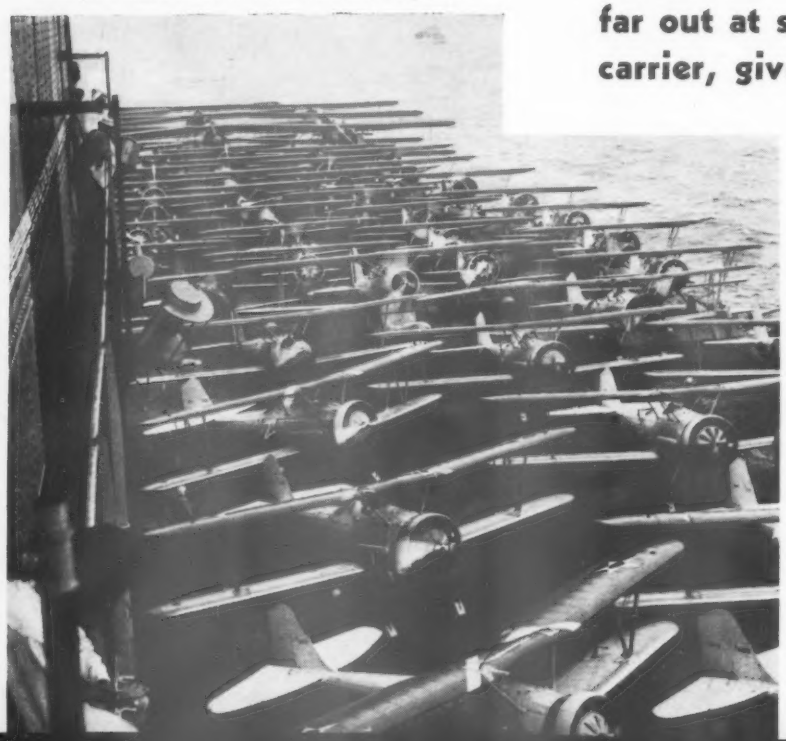
Route 1001 will operate daily except Sundays and holidays between Wilmington, Del., and Pittsburgh, Penn., serving 27 cities and towns between those two points. Route 1002 will serve another 27 towns and cities between Pittsburgh and Huntington, W. Va. Altogether 55 towns in Pennsylvania, Ohio, West Virginia and Delaware will be served. Each will be outfitted with a "Skymail Station". Each day one of the firm's six Stinsons will dive past Dr. Adams' device and hook the waiting mail bag. Fragile bottles, electric light bulbs and even eggs have been snared this way by fast-flying ships without the slightest damage.

Richard C. duPont (left) and Dr. L. S. Adams (right) now head All-American Aviation, Inc. Above is an All-American Stinson in action; below, the mail routes.

WHEELS OVER WATER



The author flew a Boeing F4B-4 fighter like those above during his tour of duty aboard the U.S.S. Lexington shown below with her deck load of planes.



by ROBERT A. WINSTON

Flying a tricky landplane fighter far out at sea, searching for his carrier, gives a pilot the jitters

The author was a pilot in Fighting Squadron One aboard the U. S. S. Lexington, when he underwent the experiences he describes in this article. Today, Mr. Winston is a flight instructor at the Naval Air Station at Pensacola, Fla., the Navy's aviation training base.

AS we approach the carrier for the rendezvous of squadrons a radio message gives us the order of landings. The other squadron of fighters is to land first, the scouting squadron second, our squadron third, followed by light bombers, with the heavy bombers last. Our skipper acknowledges over the voice radio and I settle back in the cockpit of my single-seater for a long wait. More than 50 other planes must be taken aboard before it is my turn.

The first squadron spirals down to the landing circle while the remaining

four squadrons cruise in wide circles above the carrier. I check my instrument readings and try to estimate how long it will be before I can get that cigarette and a cup of coffee. Half an hour, maybe, at the most. The minutes drag by and I glance idly at the ship to see how many planes have landed. There are only three aboard and, as I watch another plane making its approach, it veers off and goes around for another try. The ship appears to be rolling heavily, which accounts for the delay.

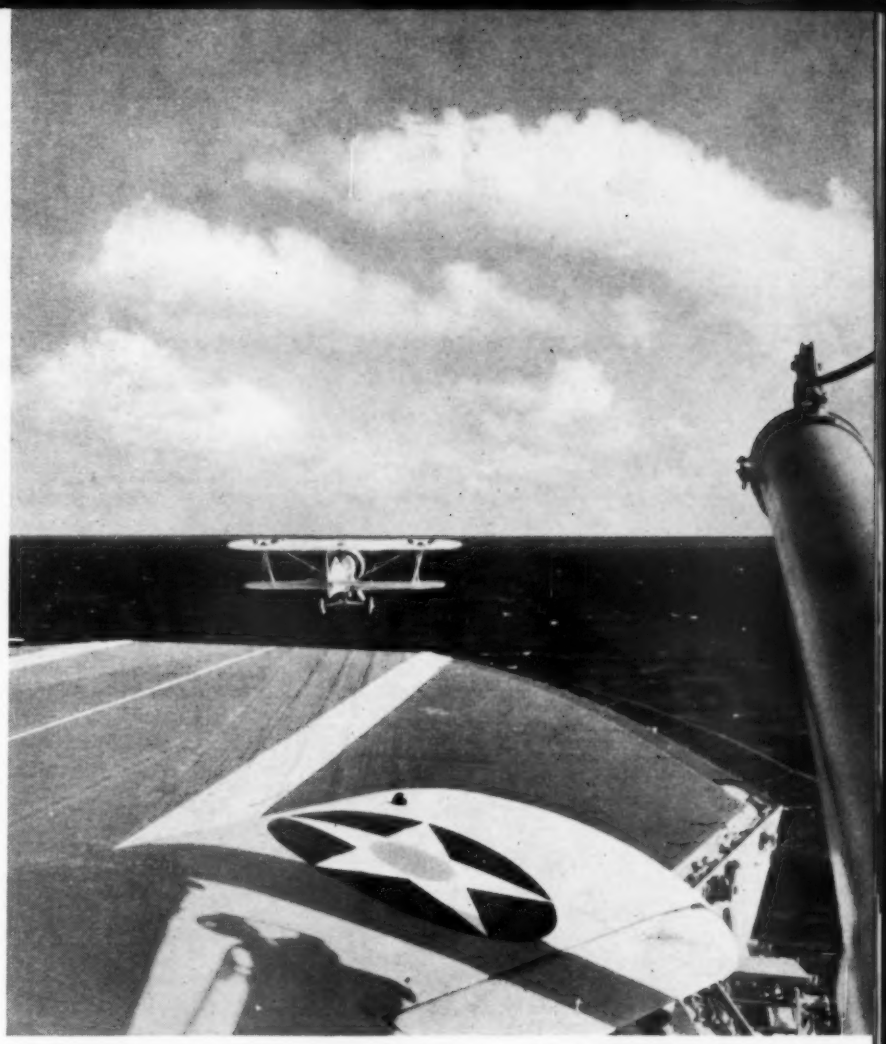
Studying the wave pattern for a moment, I see the cause. The long swells piled up by the prevailing northeast trades now are scarred by a cross-chop from a southeast wind that has come up within the last hour, so that the carrier, which has to head directly into the wind before she can take us aboard, is getting the bigger waves almost broad on her port beam. This sudden shift of the prevailing wind can mean only one thing: bad weather in our vicinity. A clicking of static in my earphones grows louder.

Scanning the horizon, I see that the disturbance is closer than I had realized. A long line of white clouds is off to the south with their tops gleaming in the noonday sun. The ship is headed towards the cloud front at an angle of about 45 degrees and the distance is closing so rapidly that by the time the second squadron has entered the landing circle it is apparent that some of us are going to get caught short. Although the cloud bank is not more than 10,000 feet high it covers a much greater area than I had expected. We could easily fly over it, but it is soon evident that we will not be able to fly around it.

As the ominous wall approaches, I see that there is a dense curtain of rain streaming down from its lower edge. In addition to bad wind conditions, we are going to have poor visibility if we have to follow the carrier into the bad weather area.

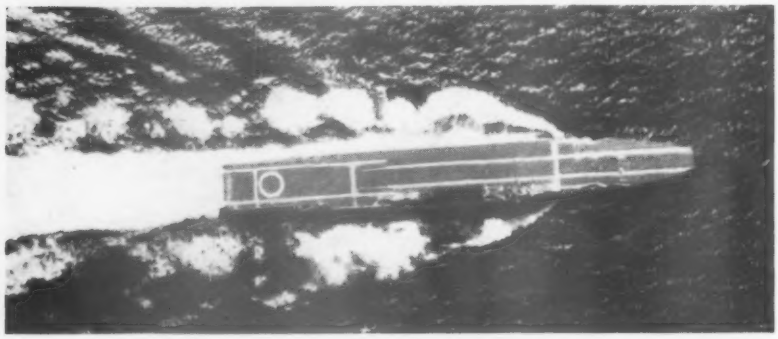
The carrier plows straight ahead into the wind, rolling and pitching as she strikes the swells. From our altitude it is difficult to realize how rough a sea she is bucking until a cloud of spray goes over the forward end of the flight deck which has been high and dry above the roughest weather we have seen during the previous six weeks of the cruise. No wonder the rest of the boys are having a tough time getting aboard!

Easing my plane back a few yards to avoid running into my section leader's ship, I watch the race against time which is taking place below us. As fast as one plane manages to get aboard, another breaks off from the section above to take its place in the landing circle while from the level above another three-plane section breaks off from the squadron and spirals down to awaits its progressive turn in the procession. Five squadrons of high-speed warplanes circling around an airport a hundred yards long and 20 yards wide—a rolling, pitching platform moving ahead into a rainstorm that is bearing down on it at 20 or 30 m.p.h. There is a rhythm about

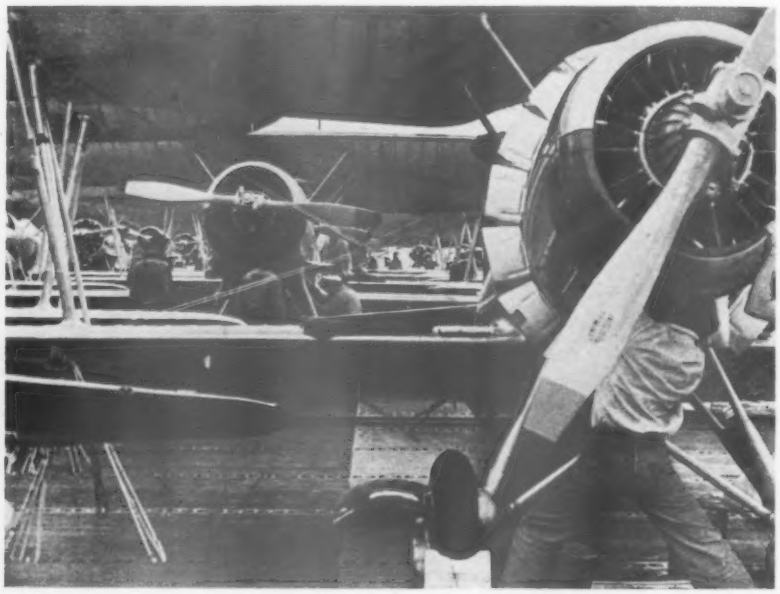


One of the author's squadron mates takes off the deck of the Lexington (above). The pursuit squadron below is "taking it easy" flying in the vicinity of San Diego while the carrier is in port. All ships shown here are Boeing F4B-4's, now retired.

Pilots aboard the carrier lead a rigid life. Early-morning call brings them to the carrier's ready-room where coffee is served and final flight orders given.



"The carrier plows straight ahead into the wind, rolling and pitching as she strikes the swells. From our altitude it is hard to realize how rough a sea she is bucking."



Airplanes on the carrier's flight deck are bunched so closely together that mechanics and pilots must crawl under wings to avoid being hit by whirling propellers.

the whole procedure that is fascinating in that it cannot be hurried; and departure from the elementary rules of timing involved and chaos would be the result. The geometric precision of the procedure would be upset, the pattern of circles and spirals would overlap, confusion would supplant order and disaster would be the inevitable penalty. At last I realize what "air discipline" really means. No hurry, no panic, no confusion—just the same timing and coordination, under pressure, that would exist under ideal conditions.

The cloud front is just ahead of the carrier now, with only half of the second squadron safely aboard. The curtain of rain streaming down from our level seems as dense as a solid wall. It advances swiftly on the ship, absorbs her bow, envelops her superstructure and obliterates her completely. She is gone like a ghost that disappears into the shadows.

The squadron ahead of us closes up to a tight formation and disappears into the wall of rain. My section leader wiggles his flippers as a sign to close up and moves down just above and to one side of the section ahead of him. I tense up a bit more as I realize that we are about to follow the carrier into the bad weather. From bright sunlight we enter the dark shadow of the towering clouds, a momentary warning before we plunge into the grey wall that rushes headlong to meet us. The rain hits suddenly, stinging my forehead above my goggles. I withdraw my head below the edge of the stubby windshield which deflects the blast up and over the open cockpit. The rain streaks by in parallel white lines. Dimly I can make out the dark shadow of my section leader's plane, although my wingman, only a few feet farther away, is invisible. For all I know, he may have pulled out of the formation, yet I feel that he must be there, flying wing and tail on our section leader just as I am doing. And our section leader, I know, is just as busy as I am, trying to keep the last wingman of the section below him in sight. The whole squadron is held together in the same manner, each trusting the man ahead of him, with the skipper flying by his instruments at the head of the procession. And somewhere in that blinding white stream are two other squadrons, linked by similar invisible ties, all relying on their skippers to take them through to safety.

A few minutes of this, then I notice a tendency to skid slightly to one side. A quick glance at my turn and bank indicator shows the pointer over to the left: either my section leader is pulling out of the formation or the skipper is making a turn to lead the squadron back into the clear weather. If the former is the case we are in a tight spot, for if the squadron ever splits up into sections or if individual planes get separated and start milling around in that blinding deluge, someone is going to get hit. I fight off a desire to pull up and out of all this uncertainty and

(*Continued on page* 72)

CLOSE-UP

Our British cameraman caught this Fairey "Swordfish" as it circled for a deck landing on H. M. S. Ark Royal.

AIRPLANES DON'T MAKE

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In the final analysis it remains for the mechanic to keep an air force operating.

There is much more to an air force than mere airplanes and pilots. The Army expansion program must include ground men to make such an air fleet at all feasible.

"SIX thousand airplanes for our air force. About 3,000 more in the Navy. Thousands of pilots. Boy, will we show 'em a thing or two about air forces! As big as anything the enemy can throw against us, according to the statistics. Just let 'em dare to start ———."

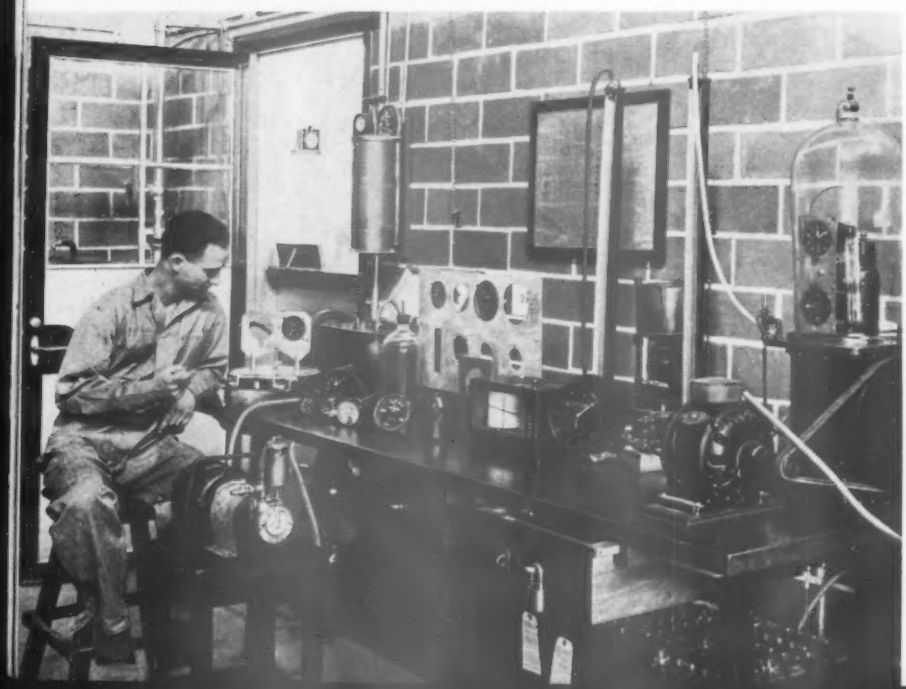
"Ever hear of bottlenecks?" asks the Military Man. "Ever hear what constitutes an M-Day air force? Ever give any thought to our Air Force five years from now? Or what it will be on July first this year? Ever wonder why the newspapers quote the Army Chief of Staff, General Malin Craig; or the Chief of the Air Corps, Major General Henry H. Arnold, as being interested in so many other projects besides the 6,000 airplanes when they speak on the Air Corps expansion program? Projects like the southeastern or northeastern, Porto Rican or Alaskan air bases, utilization of civilian flying schools for primary pilot training or the need for additional Signal Corps or Medical Department personnel in the Army?"

"The trouble with you fellows is you spread verbal smoke screens to confuse the issue," was the comeback. "Here we give you 6,000 airplanes. As if that isn't enough you want to grab everything in sight. Give you an inch and you want a mile."

"So *you* say," retorted the expert, "but get this: *airplanes alone don't make an air force.*"

And they don't! Not even if the Air Corps actually gets those 6,000 airplanes. Last month a newspaper heralded the action of the House of Representatives with the headline: HOUSE VOTES AIR ARMADA. What the house did was vote *authorization* for 6,000 airplanes (the bill has just been signed by the President). But the Air Corps' Director of Procurement can't get his corps any airplanes until *funds* are appropriated by Congressional action for the purpose, such appropriation act being separate and distinct from the act authorizing the eventual existence of so many airplanes in the Air Corps. As this is written it appears that funds will be appropriated for a generous first year increment on the total number of airplanes authorized, so we can assume that shortly the Air Corps will be on its way toward expansion—as far as airplanes are concerned.

Now 6,000 airplanes are a lot of flying machines, but their presence at Army air fields still does not mean that we



Instruments and other equipment also are vitally important to air force success.

AN AIR FORCE

★

by T-2003

have an air force. Even with a commensurate number of pilots, what good are all these airplanes unless we also have the following:

Adequate air bases.

Well organized squadron, groups, wings.

The above mentioned units well trained *as units.*

Items of auxiliary equipment, such as radio sets, aerial machine guns, bombs, flying gear, trucks, etc.

Qualified mechanics and other repair and maintenance personnel.

Other members of combat crews besides the pilots.

Personnel and organizations to administer to the needs of these additional Air Corps personnel, such as medical units, signal communications experts and units of similar character.

Trained air leaders, engineers, administrators.

Then in one or more years' time, what good would our air force be even with all the above-mentioned needs fulfilled unless there were means of *continuing* the training of leaders, mechanics, pilots and a well balanced scheme of replacing such experts when they are no longer active—as well as means for continued research in the realms of tactics and engineering?

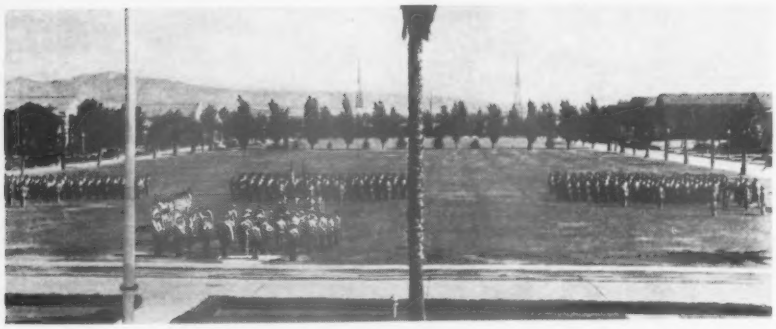
But why go on and discourage the layman interested in national air defense, when the above needs are sufficient to show the reader that this expansion is a complicated affair, that the Air Corps cannot just buy so many military airplanes, rush so many pilots through the Air Corps Training Center and then rely on the result for national defense. That would be too easy. We could retire about 1,000 of our higher ranking Air Corps officers, shut up the Material Division at Wright Field and close our present well-equipped air stations, then rent hangar space for our airplanes at various private and municipal airports from which the pilots could fly. The Air Corps fields could be used by the C. C. C., the prematurely retired older flying officers would probably live to a ripe old age unbeset by the hazards of flying and their present tremendous burden of providing for the current expansion. A good time would be had by all but . . .

We wouldn't have an air force.

For an air force is built not by money alone, but also by honest and manly sweat—and time. There is first the question of planning. Not much different than planning life insurance, when you've decided you want $6,000 worth of insurance. Insurance against what? In what form? Payable when, and to whom? Much study, of tentative plans, of getting facts and figures together in presentable form, is the lot of those charged with making the really vital decisions concerning this expansion. The "pick and shovel work" of providing plans is performed by members of the staff at various Air Corps headquarters. Readers of fiction will laugh at that. They know that staff officers wear highly polished

Army officers are working hard to increase the number of Air Corps mechanics.

An efficient air force must be built by careful planning ("pick and shovel work").



Congress has authorized the Secretary of War to detail Air Corps soldiers as students at civilian educational institutions with salaries, board and tuition fees paid for.

boots, dainty lip ornaments and an air of insouciance, and inevitably come to a bad end because of their insufferable attitude toward the boys on the firing line. Well, maybe so, but I wonder who those officers are who were working far into the night at Air Corps headquarters in the Munitions Building in Washington, or at the Training Center at Randolph Field or the Materiel Division at Wright Field? They were Air Corps staff officers, working up tentative plans, then criticizing them, tearing them down, until they got workable plans acceptable to their commanders. They would have been much happier, no doubt, at the controls of some of these new planes we see flying around Air Corps fields—but they had a job to do connected with building up a bigger and better air force and they went to it. No doubt they will get their chance at the controls of some of these thousands of new airplanes the air force is getting—thanks partly to these staff members' fine work—but the Air Corps would never get those new planes but for the "pick and shovel work" of the experienced planners. Think of the many problems they must have encountered and the discussions of each problem from many angles before a solution was found.

Take the matter of mechanics. We Americans pride ourselves, don't we, on our abundance of mechanical-minded and skilled young men, so on the surface it might look easy to recruit the mechanics necessary to take care of the several thousand new airplanes due to arrive at Air Corps fields within the next two years. Nevertheless the Air Corps will *have* to compete with the airplane industry. Soldiers start in with $21 a month. Many young men with mechanical training or capabilities would rather get jobs in factories building military aircraft than enlist for three years to start at 70 cents a day and board. Then comes the problem of training the 25 000 or so young men who are destined to swell the ranks of the Air Corps. Training them as crew chiefs, ignition specialists, machinists, metal workers, radio mechanics and operators, aircraft traffic dispatchers and clerks, to mention a few of the many specialties found in the Air Corps. Without trained mechanics the new airplanes fresh from the factory might keep on flying for about 20 hours after their

An Air Corps officer at tactical school.

receipt, but eventually comes the routine 20-hour inspection and check-up—which cannot be done by untrained men or bunglers.

Work is being rushed now to expand the facilities of the Air Corps Technical School at Chanute Field, Ill., and Lowry Field, Denver, Colo., and an additional number of officers qualified as instructors and directors have been ordered there. A basic recruit school may be established at Scott Field, Ill., to "condition" recruits and give them a basic military education before they are sent to combat units or technical schools. Congress has authorized the Secretary of War to detail Air Corps soldiers as students at civilian educational institutions to take care of the overflow which cannot be handled by the officials Air Corps schools, the Army paying these soldiers' salaries and for their board and the schools their tuition fees.

So the Air Corps gets its airplanes and mechanics—but where? Present air bases are running at about capacity, but even if they weren't, there exists a *strategic* need for bases in Alaska, the northeast industrial area, the southeast and Caribbean areas, and Panama. Without such bases the Air Force might be a unit composed of well-trained squadrons, groups and wings, well-equipped with new airplanes. But it would hardly be capable of operating *as an air force without delay* in *all* the theaters of operations in which it might be needed until bases were built to accommodate the units. It wouldn't even be well trained, in the final analysis, unless it had had opportunity to work out its tactical and strategical problems by means of maneuvers in those areas where bases may eventually be needed for the actual air defense of this country.

The Air Corps expansion will result in many new squadrons being organized. Members of House Military Affairs Committee have stated they were working on plans to provide for 19 additional National Guard squadrons and 128 additional regular Air Corps squadrons in the United States and foreign possessions; 58 of them to be combat squadrons and the other 70 to be base, headquarters and miscellaneous squadrons organized into groups and wings. General Craig, Chief of Staff of the Army—bound to keep within the limits of authorization and appropriations as finally enacted—stated that 43 new squadrons would actually be organized. With Air Corps heads concerned over the procurement of trained pilots and mechanics, they are not neglecting the problem of trained leaders and staff officers for these new outfits. We'll exclude the future leaders of the larger new groups and wings for the time being as they can always be drawn from the present senior and very capable squadron commanders. But the Air Corps school for air leadership, the Air Corps Tactical School at Maxwell Field, Alabama, will have the job of providing the formal air-military education of sufficient officers to command such squadrons and staff them and the large units also, it being a military maxim that the more important of the staff officers should have received the same military training as their commanders. Nor can the National Guard squadrons be neglected. Fortunately a small group of selected National Guard and Air Reserve officers have just completed a special course of instruction at the tactical school. Plans are now being laid to graduate 100 regular Air Corps students in each class after an intensive 12-weeks course; the normal classes having been 76 students taking a course of nine months. This school for leaders and air staff officers should not be confused with the flying school; its courses are given only to those of long and distinguished service as flying officers, with a leavening of distinguished officers from other Army branches of the Army and from Naval and Marine Corps aviation.

The air expansion program will be no sudden splurge of activity for two years, tapering off to a doldrum of marking time. Problems in engineering, personnel procurement, training, equipment and tactics not specifically anticipated at present are bound to arise as the Air Force grows in size and scope and approaches a wartime basis. Only by keep-

(*Continued on page* 80)

AGILE BOMBER

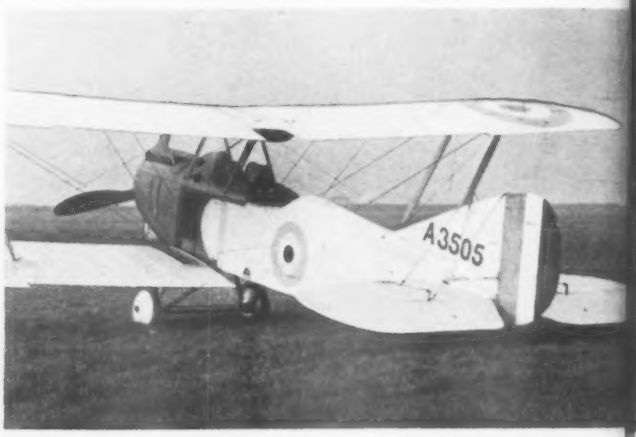
One of Britain's sleek Blenheim bombers does a snappy turn for the cameraman.

THE STORY

GUNBUS or F.B.5 had its original design completed in 1913, actually was built in 1914. It was a two-seater of all-metal construction and was powered with a 100 h.p. Gnome.

F.B.8 was dated 1915, was powered with two 100 h.p. Gnome engines and carried one Lewis gun. The rings around the engines were not streamlining, were to prevent oil splashing.

BULLET was one of the first one-place tractor scouts. Designated E.S.1, this design first was flown in 1915. Top speed was 114 m.p.h., it was well streamlined but unarmed.



F.B.14, produced in 1916, was to have been fitted with 200 h.p. engines, had to use 160 h.p. instead. After several experimental engines, the entire type was dropped.

F.B.12 was this strange-looking fighter designed in 1916. A single-seater pusher, this "flying bathtub" was designed for a 150 h.p. engine, had to use an 80 h.p. motor instead.

VAMPIRE was the new name given this F.B.26 armored trench-strafer. This type was designed to take three machine guns. Top speed with a 200 h.p. B.R.2 rotary engine was 118 m.p.h.

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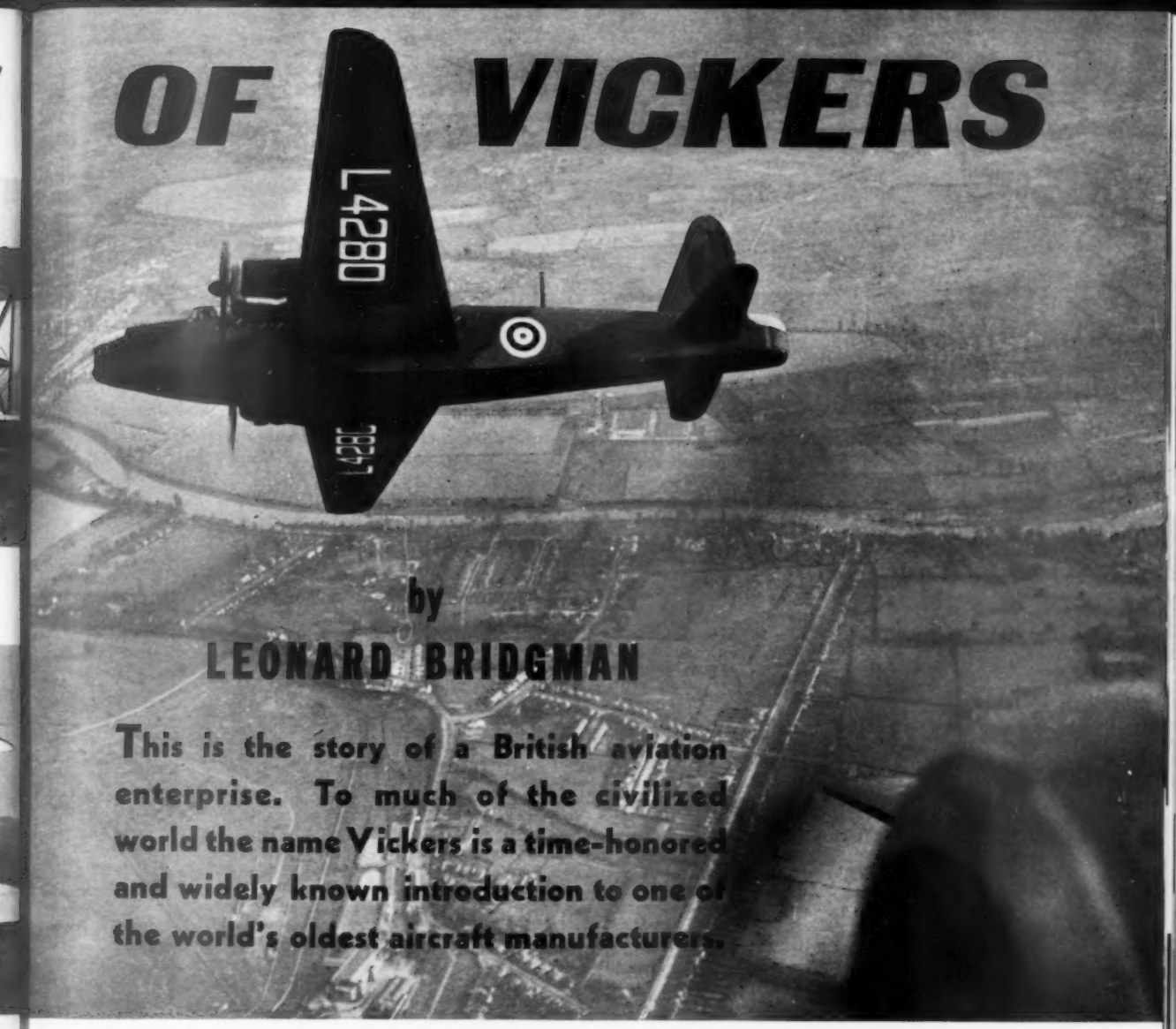


by

LEONARD BRIDGMAN

This is the story of a British aviation enterprise. To much of the civilized world the name Vickers is a time-honored and widely known introduction to one of the world's oldest aircraft manufacturers.

Currently popular Vickers product is this "Wellington" bomber.

Leonard Bridgman is one of the leading international authorities on aviation. He is 41, lives in London, has been in aviation since 1913. He is an expert artist and draftsman as well as writer.

IN the heavy industrial world the name Vickers stands out prominently. Although the ramifications of the great group of companies now associated with that name cover the widest industrial field it is, perhaps, in the world of armaments that the name Vickers has its greatest significance. Ships of every size, from the largest battleships down to submarines and torpedo craft, guns of every type and calibre, tanks, armored-cars—in fact, every instrument of offense and defense—fall within the scope of the Vickers group of companies, from the raw material to the finished product.

It is not, surprising, therefore, that early in the history of aviation the Vickers concern should have shown a practical interest in the military possibilities of flying. Its first experiments were associated with lighter-than-aircraft and the company's tender for the construction of the first British rigid airship was accepted by the Admiralty in May, 1909. This ship, appropriately known as the *Mayfly*, was completed but broke its back before it ever got into the air. During the War the company again undertook airship construction and, in addition to turning out two Parseval semi-rigids and number of the smaller non-rigids, it built the big rigids R.9, R.23 and R.26. The R.9 was notable as being the first British rigid airship to fly.

In this article, however, we are mainly concerned with the development of the Vickers airplane from the early "box-kite" days to the latest Vickers geodetic construction of today.

The aviation division of Vickers, Ltd. was formed in 1911. The company was naturally interested in metal construction and at the outset it bought the license for the French R.E.P. all-steel monoplane. Using this form of construction as a basis, the British firm proceeded to develop its own designs. A flying school was opened at Brooklands and Vickers all-steel "box-kite" biplanes and Vickers-R.E.P. monoplanes were used, the slogan of the school being "from slow biplanes to fast monoplanes." Those trainers were quite successful.

The first successful Vickers airplane of original design was completed in 1913. This was the F.B.5 or "Gun-bus," a two-seat pusher biplane of all-steel construction and designed to mount a machine gun in the nose of the nacelle. It was fitted with a 100 h.p. Monosoupape Gnôme engine, which gave it a speed of 70 m.p.h. at 5,000 ft. Convinced of its ultimate usefulness the company decided to lay down a batch of 50 on speculation, an enterprise which was rewarded on the outbreak of war in 1914 when the British War Office adopted the type and proceeded to experiment with the installation of a Lewis gun. In

HERE CAN BE SEEN THE EVOLUTION OF ONE

TYPE 151 was a novel 1929 product which used the much discussed Vickers-Wibault process of metal construction.

VIASTRA was the most notable design produced in 1930. This twin engined ship, too, used the Vickers-Wibault construction.

July, 1915, No. 11 squadron of the Royal Flying Corps, equipped with the Vickers two-seat fighter, flew to France. This was the first homogenous unit to be equipped with an aircraft specially designed to carry offensive and defensive armament. This type remained on active service until the spring of 1916.

The next type was the E.S.1 or *Bullet*, one of the first single-seat tractor scouts. It made its first flight in August, 1915. With a 100 h.p. Mono-Gnôme it had a top speed of 114 m.p.h. and climbed to 5,000 ft. in 6.6 minutes. It was so well streamlined, with its pot-bellied fuselage the same diameter as the rotary engine, that the pilot's view suffered. Also, it had no armament. A development known as the E.S.2 had its maximum speed increased to 120 m.p.h.

Then followed the F.B.7 (August, 1915), which was one of the first twin-engined machines to fly. This had two 100 h.p. Mono-Gnôme engines and was designed to carry a Vickers automatic gun. Twelve were ordered by the War Office but a shortage of Mono-Gnômes resulted in the 80 h.p. Renault being tried as a substitute. This led to a complete loss of performance and cancellation of the contract at the request of Vickers, Ltd.

The F.B.8 (November, 1915), was a smaller version of the F.B.7, but with the same engines and intended to mount a Lewis gun. It is interesting to note the embryo Townend rings round the engines. Actually these rings were merely intended to prevent oil being slung over the machine and crew. Spattering castor oil was one of the biggest drawbacks to a pleasant day of flying in those times. The engines of the F.B.8 were, naturally, rotaries and consequently whirled around on their mounts at a great rate and generally making things uncomfortable. Yet, the ship's performance improved. The top speed had been raised from 75 to 98 m.p.h. but the type was abandoned for the same reason as recounted for the F.B.7.

The F.B.9 was a cleaned-up version of the F.B.5 "Gun-bus" and had a Vee undercarriage, streamline wires and other improvements dictated by experience with the F.B.5 on active service. Its maximum speed went up to 80 m.p.h. at 5,000 ft. and it climbed to 5,000 ft. in 13 minutes. This type replaced the earlier F.B.5 in France.

The F.B.12 (June, 1916), was a single-seat pusher fighter designed for the 150 h.p. Hart engine. This engine never emerged from the experimental stage and the 80 h.p. Le Rhône was used instead. With this engine the F.B.12 had a top speed of 95 m.p.h. A smiliar machine with the 100 h.p. Mono-Gnôme was sent to France in December, 1916, for service trials.

The F.B.14 (August, 1916), was a two-seat tractor biplane designed for the 200 h.p. B.H.P. engine. This engine was not ready in time and the 160 h.p. Beardmore was substituted. In spite of a reduction in designed performance due to the reduction in power the machine was put into production. One hundred and fifty were delivered without engines owing to troubles with the 160 h.p. Beardmore and the 120 h.p. engine of the same make was tried. This resulted in the complete disappearance of performance and the type was abandoned. Later in 1917 one F.B.14 was fitted with a 250 h.p. Rolls-Royce, was well reported on at Martlesham, the official testing station, and was then used for experimental gunnery work at Orfordness. In the German air raid on London in July, 1917, this F.B.14 came up with the enemy and followed them right across the North Sea. It could not engage owing to the experimental gun-sights under test proving ineffective in practice.

The F.B.16 (December, 1916), was a single-seat fighting scout originally designed for the 150 h.p. Hart engine. This engine not materializing, the 150 h.p. Hispano-Suiza was installed. After overcoming certain teething troubles a modified version known as the F.B.16A was sent to Martlesham and was favorably reported on. It was said in the official report that the F.B.16A surpassed the famed S.E.5 and other types with the same engine, but the War Office decided not to disturb production by interfering at a critical stage with the large orders for the S.E. 5 which were then on course of fulfilment. The F.B.16A had a maximum speed of 135 m.p.h. at 10,000 ft. and climbed to that height in 10.4 minutes. Subsequent experimental versions of the F.B.16 were fitted with the 200 h.p. Hispano (F.B.16B), the 275 h.p. Lorraine (F.B.16C) and the 300 h.p. Hispano-Suiza (F.B.16D).

The F.B.24 (December, 1916), was a two-seat fighter also intended for the mysterious Hart engine. Failure of this engine to materialize resulted in the type being abandoned, although the prototype was later fitted with both the 220 h.p. and 275 h.p. Lorraine and the 200 h.p. Hispano. With the big Lorraine the F.B.24 had a top speed of 130 m.p.h. at 10,000 ft. and climbed to that height in 11 minutes.

The F.B.25 (1917) was designed at the request of the War Office to take the Crayford rocket gun for use against hostile airships. It was a pusher biplane with staggered side-by-side seating and was designed for the 200 h.p. Hispano-Suiza. Again shortage of engines led up to the need to substitute another type of lower output and performance suffered. As the incendiary bullet had been perfected in the meantime, the rocket gun was abandoned and so was the machine.

The F.B.25 (1917) was a single-seat pusher scout with the 150 h.p. Hispano-Suiza engine. Six were built to take the Eeman triple gun mounting for forward and elevated fire. The forward-firing mountings were satisfactory but the elevated mounts were unwieldy and were abandoned. The machine was then modified as an armored trench-strafer, fitted with the 200 h.p. B.R.2 rotary engine and renamed the *Vampire*. In this form the machine had a top speed of 118 m.p.h. at 5,000 ft.

The F. B. 27 (November, 1917) was designed to a government specification for a twin-engined bomber. The first machine, which later became known as the *Vimy*, was fitted with two 200 h.p. Hispano-Suiza engines and at Martlesham Heath this machine distinguished itself by lifting one-third of a ton more than other twin-engined jobs of a similar type fitted with 300 h.p. engines. The second model was fitted with two 260 h.p. Sunbeam *Maori* engines and the third with two 300 h.p. Fiat engines. At this stage the *Vimy* was put into production and orders for over 1,300 were placed with various firms in the industry.

(*Continued on page* 46)

OUTSTANDING MANUFACTURER'S PLANE-BUILDING

VESPA. This is the standard version of the model which broke the altitude record in 1932. It was originally produced in 1925.

TYPE 123 appeared in 1926 and was the first post-war single-seater Vickers fighter with a Hispano-Suiza 400 h.p. engine.

TYPE 141, dated 1927, was an interesting single-seater fighter. Powered with a Rolls Royce engine, this ship mounted two guns.

VENDACE was produced in 1927. Its "long-legged" appearance is due to its intended function as a deck-landing trainer.

VIREO was an unusual ship in many ways. Though built in 1927, it was intended as a ship-board fighter. It was all-metal.

VICKERS-WIBAULT fighter, also a 1927 design, looked more French than British. It was powered with a Bristol "Jupiter".

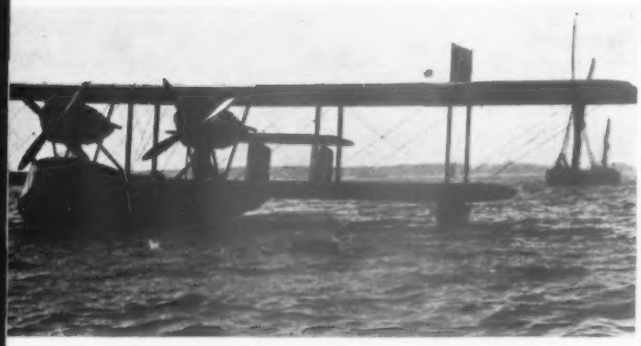
VILDEBEEST's prototype, built in 1928, is shown above. This particular design underwent several refinements and revisions.

TYPE 143 was a fighter produced for the Bolivian government in 1929. It was powered with a supercharged "Jupiter".

THIS HISTORICAL PICTURE ALBUM OF VICKERS

VIMY was the name of this bomber produced in 1918. The engines were two 400 h.p. water-cooled Rolls Royce "Eagles."

VIMY COMMERCIAL was the result of the Vickers company's capitalizing on the "Vimy's" excellent load-carrying ability.



VALENTIA III was powered with two 650 h.p. engines and was a product of 1919. This flying boat's hull was copper-sewn plywood.

VIKING won the 1920 Air Ministry competition for commercial amphibians. Its hull was copper-covered plywood ("Consuta").

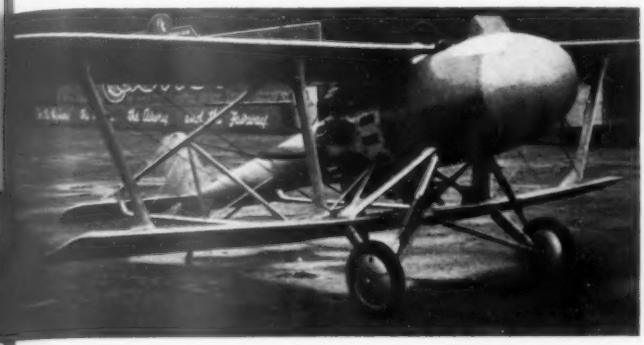
VIRGINIA and VIGET were Vickers bomber and lightplane respectively. The former was standard R.A.F. equipment for years.

VULCAN appeared in 1922 and was an eight-seater single-engined commercial biplane powered with a 450 h.p. Napier "Lion".

VANGUARD, a 1922 airliner, carried 23 passengers and a crew of two. This ship was redesigned as a troop-carrier.

VIXEN was a two-seater reconnaissance fighter produced in 1923. The engine was a water-cooled 450 h.p. Napier "Lion"

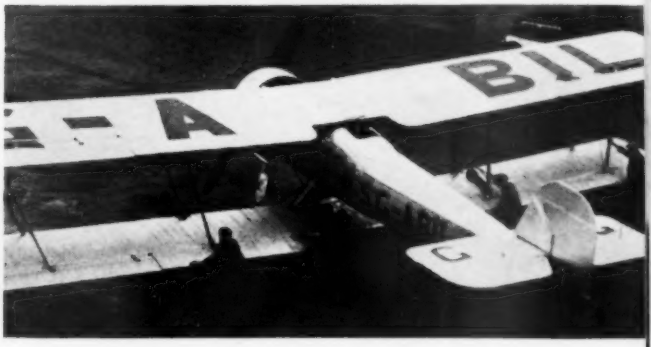
AIRCRAFT CONTAINS MANY RARE PHOTOGRAPHS



F.29/27 was a secret pusher fighter of 1931. This ship was developed to mount a large-caliber automatic gun.

VILDEBEEST was a torpedo-bomber developed in 1928 and on through 1934. This ship was produced for the pre-war Spanish.

JOCKEY was an experimental interceptor fighter that appeared in 1931. This was a development of the old Type 151.



VESPA was a 1932 product in which a world's altitude record of 43,965 feet was attained. The engine was a "Pegasus".

VILDEBEEST appeared again in new dress in 1933. This version of the ship was shortly adopted by the Air Ministry.

VENOM, built in 1936, was the first military airplane to be fitted with a sleeve-valve engine. Note American propeller.

WELLESLEY is currently standard in the R.A.F. and is one of the two geodetic-type machines Vickers are producing.

SPITFIRE is Britain's latest fighter now in mass production, originally designed by the Supermarine company.

(*Continued from page* 42)

In October, 1918, a fourth model was fitted with two 400 h.p. Rolls-Royce *Eagle* engines and under test at Martlesham this machine carried a load of 12,500 lbs. (nearly six tons), including sufficient fuel for 11 to 12 hours endurance, at a speed of 100 m.p.h.—then a remarkable performance.

Before the *Vimy* could prove its mettle in service the War ended and most of the orders for this type were cancelled. It was, however, to earn undying fame by achieving three great "firsts" in post-war long-distance flying.

On June 14-15, 1919, a standard *Vimy* fitted with two Rolls-Royce *Eagle* engines and piloted by Capt. John Alcock and with Lieut. Arthur Whitten-Brown as navigator, made the first non-stop crossing of the Atlantic. It flew from Newfoundland to Clifden, Ireland, a distance of 1,890 miles in 16 hours 27 minutes at an average speed of 117 m.p.h. The machine carried 850 gallons of fuel, or sufficient for a range of 2,240 miles.

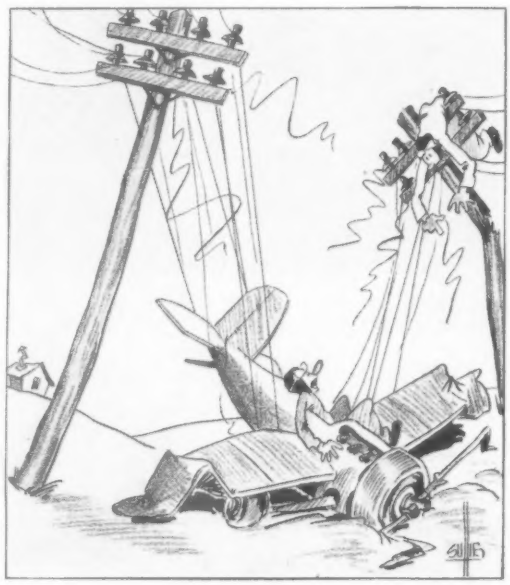
Another standard *Vimy* won the Australian government prize of £10,000 for the first flight from England to Australia in a British machine. Piloted by Capt. Ross Smith and Lieut. Keith Smith and carrying two mechanics, the *Vimy* left Hounslow, London, on November 12 and arrived at Port Darwin, North Australia, on December 10, 1919. The distance of 11,130 miles was covered in 27 days, 20 hrs. 20 mins.

A third *Vimy* piloted by Colonel Pierre van Ryneveld and Capt. Quintin Brand made the first flight from England to South Africa. Leaving London on February 4, 1920, all went well until they were attempting to take-off from Bulwawyo on the last stage to Cape Town. The airport there is 4,400 ft. above sea level and the heavily-loaded *Vimy* failed to rise and crashed. The pilots completed the journey to Cape Town in another machine but the major honors for the first England-South Africa flight may be safely claimed for the Vickers *Vimy*. The total distance of 8,300 miles was covered in four days 13½ hours flying time.

The Vickers company was not slow in taking advantage of the remarkable load-carrying capabilities of the *Vimy* and in 1919 there appeared the *Vimy Commercial*, in which a large cabin fuselage was substituted for the inhospitable military body, all other components being of the standard *Vimy* type. Another 1919 product was the *Valentia* twin-engined flying-boat in which the hull was made of a special copper-sewn plywood known as Consuta.

In 1920 the Vickers company sent a mission to China and equipped this mission with *Vimy* two-seat instructional machines and *Vimy Commercial* biplanes, the latter being intended to open up certain civil routes in China. The *Vimy* was a pusher biplane using wings and tail unit of the wartime F. E. biplane but with a Vickers-designed nacelle and landing-gear. It was fitted with a Rolls-Royce *Eagle* engine. The Chinese were unreceptive and the mission failed to achieve its aim.

In the same year the *Viking* boat amphibian won the Air Ministry competition for commercial amphibians. The *Viking* was a single engined flying-boat with a Consuta-built hull and two-bay biplane wings. The 450 h.p. Napier *Lion* engine drove a pusher propeller and gave the machine a maximum speed of 121 m.p.h. Subsequent variants of the *Viking* were the *Vanellus* (1923), a three-seat reconnaissance amphibian, and the *Vulture* (1924), which was specially developed for a round-the-world flight. This machine, piloted by Sq. Ldr. A. C. S. MacLaren and Flt. Lt. W. N. Plenderleith and carrying a mechanic, left Calshot March 25, 1924, but was ultimately obliged to abandon its ambitious venture in the impenetrable mists of the Kurile Islands, 13,000 miles from the starting point in far-off England.



". . . D'ya think we broke in on anybody's conversation? . . ."

In 1922 the *Vulcan* eight-seater single-engined commercial biplane appeared. This machine was distinguished by its huge fuselage which completely filled the gap between the wings. It was used on the London-Paris air service for some years. Other 1922 products were the *Vanguard* twin-engined commercial biplane for a crew of two and 23 passengers, the *Victoria* troop-carrier version of the *Vanguard*, and the *Virginia* twin-engined bomber. The *Vanguard* and *Victoria* were identical except for their slightly varied functions and were similar to the *Vimy Commercial* but of considerably enlarged dimensions. The *Virginia* used the same wings, tail and landing-gear as the *Vanguard* but had a slim fuselage with gun positions and other military furnishings. The *Virginia* was a standard bomber in the Royal Air Firce until comparatively recently. The *Victoria* was also adopted by the R. A. F. for troop-carrying duties in the middle east and in its modern form with metal wings, oleo landing-gear and *Pegasus* engines it is still in use under the name of *Valentia*. During the Afghan revolt in 1928-9 *Victorias* were used to evacuate 600 men, women and children from the Afghan capital to Peshawar. They made 83 flights over mountains and brigand-infested country and covered a total distance of 33,000 miles in this historic epic.

Another 1922 Vickers machine adopted by the R. A. F. was the *Vernon*, a twin-engined troop-carrying version of the *Vimy Commercial*. This machine was also in extensive use in the Middle East and was responsible for a lot of the pioneer work on opening up the Cairo-Baghdad air route, now part of the airway to the East.

The most interesting products of 1923 were the *Viget* and *Vagabond*, two ultra-light biplanes built for the Air Ministry light airplane competition, and the *Vixen*, a two-seat general purpose military biplane. The two light biplanes were handicapped by the unreliability of their converted motorcycle engines.

In 1925 the company produced the *Vespa* to an official specification for a two-seat Army co-operation machine. It was not successful in getting an Air Ministry order but the type was adopted by the Bolivian government in 1929 and by the Irish Free State Air Corps in 1930. In 1932 a *Vespa* fitted with a special supercharged Bristol *Pegasus* engine put up a world's height record of 43,965 ft., piloted by Cyril F. Uwins, the chief test pilot of the Bristol company.

In 1926 the first post-war Vickers single-seat fighter, the Type 123, appeared. This machine was interesting in that it was fitted with a French 400 h.p. Hispano-Suiza engine.

In 1925 the Vickers company acquired the license for the French Wibault all-metal monoplane and in 1927 a series of Vickers-Wibault single-seat fighter monoplanes was built to the order of the Chilean government. The Wibault system of construction was adapted to other types of Vickers designs, notably the *Vireo* (1927) single-seat deck-landing monoplane and the Vickers Type 15 (1929) single-seat fighter. Other 1927 products were the Type 141 single-seat fighter with a Rolls-Royce "R" engine, the *Vendace* two-seat deck-landing and seaplane training biplane, the *Vivid* two-seat, all-metal version of the *Vixen*, with a 450 h.p. Napier *Lion* engine, and the *Valiant*, a general purpose version of the *Vivid*, and fitted with the Bristol *Jupiter* radial air-cooled engine.

In 1928 the aviation division of Vickers, Ltd., was formed into a separate subsidiary company known as Vickers (Aviation), Ltd., which took over the manufacture of aircraft, accessories and

equipment. In the same years Vickers (Aviation), Ltd., took over the control of the Supermarine Aviation Works, Ltd. This year was also notable for the complete change-over to metal construction for, although it may be remembered that Vickers, Ltd., pioneered metal construction in England before the war, the exigencies of wartime production compelled a reversion to wood and fabric structures until such time as it was possible to develop a new technique, investigate the properties of metals and train personnel to work them.

The most notable products of 1928 were the *Vildebeest* torpedo-bomber and the *Vellore* single-engined commercial freight-carrier. The *Vildebeest* was first adopted by the Spanish government in 1931 and the license was acquired for its construction in Spain as a torpedo-carrying seaplane fitted with the Spanish-built Hispano-Suiza engine. In 1933 the *Vildebeest* was adopted by the Air Ministry as a torpedo-bomber and fitted with a Bristol *Pegasus* engine. In 1934 a general-purpose version of the *Vildebeest* was adopted by the Air Ministry for service in the middle east. This model, which carried the most comprehensive desert equipment, was named the *Vincent*.

In 1928 several veterans were given a rejuvenation treatment. The old wartime *Vimy* was revived as a twin-engined trainer with two Bristol *Jupiter* engines, and both the *Virginia* and the *Victoria* were re-engined with *Jupiters* and provided with metal wings.

The *Vellore* freighter was ordered by the Air Ministry for allocation to Imperial Airways, Ltd., but in 1929 this machine was flown to Australia by two young Australians and it never came back. In 1929 the Type 143 single-seat fighter was produced for the Bolivian government. Fitted with a Bristol *Jupiter* supercharged engine this machine had a maximum speed of 176 m.p.h. at 13,120 ft. The Type 151 fighter using the Vickers-Wibault metal construction also appeared. Finally, a new version of the *Vellore* fitted with two Bristol *Jupiter* engines was turned out.

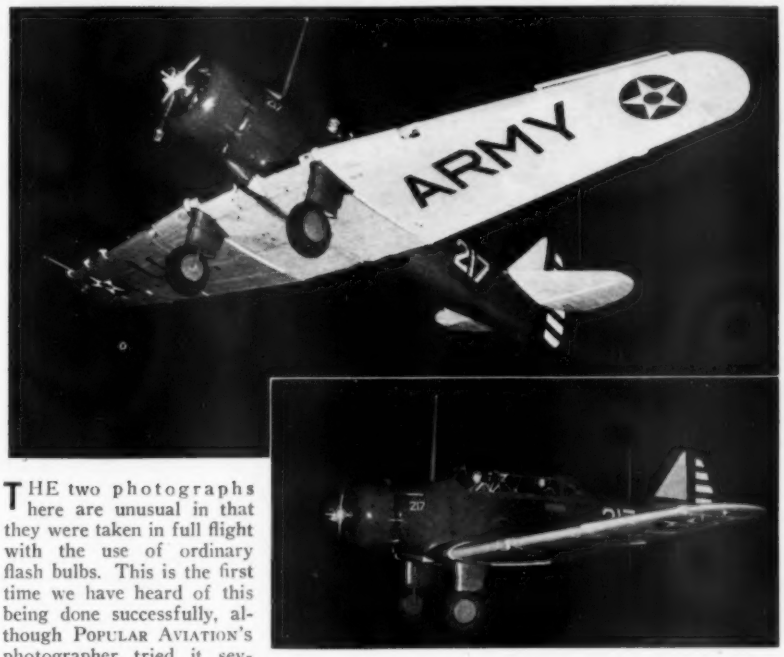
The most notable machine of 1930 was the *Viastra*, an all-metal transport monoplane using the Vickers-Wibault form of construction. This type appeared in single-twin- and triple-engined forms, but only the twin, which was developed for Australia, was perpetrated. A machine of this type was supplied for the use of H. R. H. the Prince of Wales in 1933.

Three interesting new types appeared in 1931. These were the *Jockey* single-seat interceptor fighter developed from the Type 151, the Type 163 bomber and troop-carrier fitted with four Rolls-Royce *Kestrel* engines, and the type F.29/27 single-seat pusher fighter specially developed to mount a large-calibre automatic gun. The picture of this last-mentioned machine is the first which has ever been published. None of these machines passed the experimental stage.

In 1932 a new twin-engined bomber appeared. This was the Type B.19/27, a smaller version of the type 163 and

(*Continued on page* 86)

Night Flash Photo



THE two photographs here are unusual in that they were taken in full flight with the use of ordinary flash bulbs. This is the first time we have heard of this being done successfully, although POPULAR AVIATION's photographer tried it several times a number of months ago with the cooperation of a Naval Reserve aviation squadron. The pictures above were taken by Private Leslie W. Bland of Randolph Field's photo section with Lieut. Hugh O'Daniel, a Randolph Field instructor, flying the camera ship. The pilot of the "subject" was Lieut. H. R. Hughes, also a flying instructor. The pictures were made 3,000 ft. over the field at 10 p.m. These men now are trying the same picture for POPULAR AVIATION on color film.

Inside the DC-4

HERE is one of the first photographs of the Douglas DC-4 completely outfitted inside as she will be for normal airline operations. Designed to carry 42 passengers and a crew of five, this ship now is touring certain parts of the country in the hands of a United Air Lines crew. They are taking it to various cities on United's route for public inspection. No passengers can be carried as yet. Following United's test period, the ship will be turned over successively to American and TWA for similar flights. None have as yet announced any intentions of buying the giant, although KLM, the Royal Dutch airline, has said it will be in the market for DC-4's if American companies place initial production orders.

Bug Fighters

By HAL MacKAY

One of the hardest-worked groups of pilots are the crop dusters. This is the story of their vocation.

At least one company uses converted Pitcairn autogiros for crop dusting. The 'giro can hover over crops at slower speeds than conventional ships.

The dusting pilot must plan his rows as to length, always watching for obstructions.

IF YOU happen to be a resident of that part of Dixie commonly designated The Delta you are among those who yearly witness the trek of the most unusual and hard-flying group of pilots known to the air industry. Those men who, after the cotton season begins near the middle of June, take up temporary residence at some convenient center in the cotton country with but a single thought in mind—dusting cotton, for the prevention of infestation by the dreaded boll weevil and Army worms.

These men, whether young or old, are fellows who are trained in this discriminating work almost to the point of exclusiveness. They may be airline pilots on leave for the duration of the season, pilots from private life or pilots who make a practice of dusting but, whatever their status of life, they must possess that training peculiar to dusting.

For a period of approximately two months they are to be an intricate cog in one of the country's leading industries —cotton. Their work is so specialized that it requires more than mere hours in the air to prepare them to perform the numerous tasks connected with the job of dusting. Consequently, although they are a restless bunch, they also are a hard working lot who realize the period of their work is short and undertake the job at hand with an enthusiasm seldom seen anywhere in the flying game. From before daylight until well after dusk, they are occupied with the work associated with dusting—looking over acreage for future dusting, checking it for evidence of the ever present weevil, fixing in their minds the location and contour of the acreage to be worked or, more important, working on the planes to get them in shape and keep them that way so that they know the ships are always in condition. Although they do not necessarily take chances with weather conditions or cross-country trips, the fact that the work is done at extremely low altitudes prompt the pilot to exert every precaution possible to assure himself his particular ship is in good condition at all times.

Personally these fellows differ little from the ordinary pilot, constituting a group that for the most part was given the job because it came up from the school of hard knocks and knows plenty about airplanes—a knowledge acquired by flying hour after hour under all conditions. Obviously, it isn't a job for a white-collar pilot.

More often than not they have received their early training either in Jennies or a similar ship of that period and on down through the OX stage to modern equipment, being an old-timer at dusting. Or possibly the chap is younger and had his training at some accredited school. Nevertheless, he must show evidence that he is qualified to properly handle the equipment as well as be a good diplo-

Approaching the field the pilot lines himself up with his row or swath and throttles back to proper cruising speed. This is as slow as possible to prevent "boiling".

Constant operations at extremely low altitudes make the pilot's life uneasy.

mat and salesman, assuming the role of mediator and agent between his employer and the many planters.

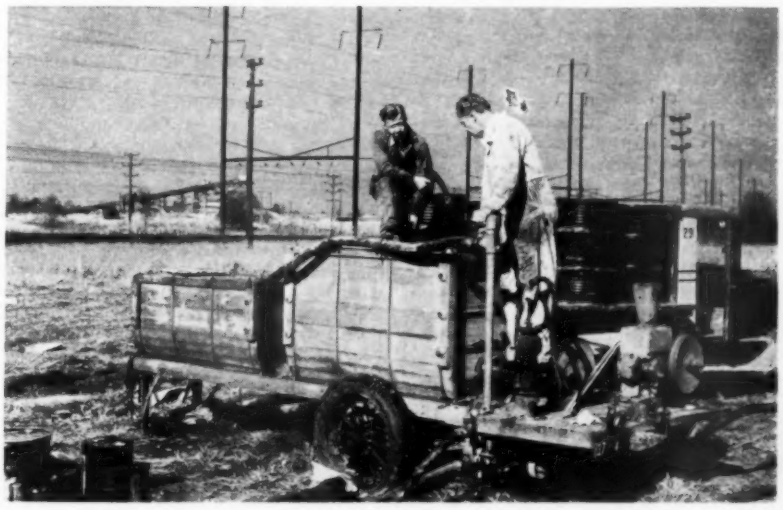
Should you be a new aspirant to the business of dusting and write to some company for an application you will be asked for a résumé of your experience as a pilot and, should this seem satisfactory—and the concern needs a pilot—you will receive instructions to report for a tryout prior to the opening of the season.

On arrival at the field you immediately will be escorted to a training ship, usually a J-5 three-place open job. You crawl in the back cockpit and the chief pilot gets in the front, after first explaining the procedure of dusting. Then he will take off and select a field suitable for the test and make a couple of trips across the plot to acquaint you with the procedure. Then you take the controls—and you'd better be good. If you aren't you will soon know about it but, it you are satisfactory you will be put on the payroll. Immediately you will be asked to get to work, for there is always plenty to be done around a dusting outfit: getting the equipment in shape, checking acreage or any other little problem that may arise preparatory to getting the season under way. The mere fact that you are a pilot doesn't exempt you from any odd ground job that might present itself.

Even though you have proven you can fly and may turn out to be a good duster, you still must serve a season or two as an apprentice, taking the small and left-over jobs on the older pilots. So for this reason you had better have a lot of what it takes or you are likely to break down about mid-season and prove to be a flop because even though the work sounds exciting and the remuneration is somewhat above the average there is plenty of hard work, long hours, nerve-wracking experiences and much else to test not only your flying skill but also your ability to take it day after day and still climb in there each morning and pour out more dust.

Since the early days of cotton planting, the boll weevil and Army worm

This is one type of liquid spray mixer which prepares mixtures to be used by a crop duster. Both liquids and dusts are used, depending upon the particular crop involved.



In many respects the autogiro is an ideal machine for dusting. An experienced 'giro pilot can hover his ship at low altitudes and literally push his chemicals into hollows.

have been a menace and the planters have been frantic for years in an effort to contrive a means of coping with the ever-present pestilence that yearly punctures the tender boll of millions of plants.

In the early days there was much experimenting with numerous types of poison, the dust being applied by hand but with little success. Later, the many farm machine manufacturing companies attempted to develop an effective machine to spread the dust on the precious young cotton from the ground. Even this method was not completely successful. Then, someone conceived the idea of spreading dust from an airplane and the present satisfactory kill was ultimately accomplished.

Contemporary with the burst of progress during the pre-depression days, dusting by plane was in the experimental stage and, quite naturally, met with much criticism and many adversities. Improper equipment, insufficient knowledge of the correct procedure of application and numerous other contributing factors, retarded the advance of this phase of flying.

Nevertheless, those that dreamed of the possibilities of employing an airplane as a means of aiding the cotton industry spent years of work and large sums of money developing newer equipment and experimenting with it in order to convince the ever-skeptical planter it could be done.

So, from that meager embryonic era, they have progressed to the present day immense set-up of the various companies with their modern equipment. Largest among these concerns is Delta Air Lines, operating a dusting branch in addition to their airline, yearly dusting cotton throughout the south and later journeying on into the Florida district for citrus dusting during the winter months. Other major companies in The Delta are Finklea Brothers, Joe D. Greer Co., Greenwood Air Service and J. O. Dockery Co.

The planes are either designed and built primarily for dusting purposes as are the Huff-Delands of Delta or—a more common procedure—are converted ships such as Travelairs, Stearmans, Eaglerocks, Wacos or similar ships. Regardless of the type or manufacture these ships are practically worthless for any other work, making this side of the picture one of some little investment on the part of the operating companies.

On a three place job, the power is usually supplied by a Wright J-5 engine which has proved to be quite reliable for this type of work. However some of the larger ships, such as the big castoff airline Stearmans, require more horsepower in which case a J-6-7 or J-6-9 is used, depending on the size of the hopper and the load to be carried.

To convert a three-place job to a duster, the front cockpit is stripped of all the interior and a galvanized or aluminum tapering hopper built in, utilizing as much of the available space as possible. After the metal is patterned and placed it is either riveted or bolted with the overlapping joints and cracks being calked somewhat as a boat would be, to prevent the dust from leaking.

The top of the hopper is as large as the original cockpit opening and is covered by a metal, hinged door. The bottom of the tapering hopper has an opening six or eight inches wide and 24 to 30 inches long. The flow of the dust is regulated by a sliding door controlled by a handle from the cockpit. Inside the lower hopper is a revolving agitator to prevent the dust from packing down and hindering the flow through the opening. The shaft of this agitator extends to a gearbox on one wing, to which is attached a small propeller which furnishes the power necessary to revolve the agitator.

Attached to the hopper opening is a box-like enclosure, called the venturi, with the front and back ends open to collect the prop blast and forming a wind tunnel, thus spreading the dust over the terrain as soon as it is released from the hopper door.

The smaller ships, such as the Waco and Eaglerock, have hoppers capable of carrying about 500 pounds of dust while the larger ships may carry as much as 1,000 or 1,200 pounds, as in the case of Joe Greer's big Stearmans. Otherwise, the ships used are little different than the ordinary three-place open ships on any airport—the altimeter, rate of climb, bank and turn and other similar instruments are removed to eliminate excess weight. The gas tanks are adequate to carry enough gas for three to four hours of flying, this being the usual length of time a ship need be away from its base.

Each morning at about four o'clock, the gang congregates in some all-night restaurant for a cup of coffee. Then, on arrival at the field (usually not much of an airport) each man checks his particular ship's gas, oil and controls. He has previously made a preliminary trip to his acreage, looking over the plots to be dusted and a so selecting a suitable field on which to land, usually an alfalfa patch or a grass meadow. In most instances it is none too large.

As soon as there is enough light for the pilot to find his landing field, he takes off into the early morning haze straight for the plantation where he is to work. Arriving there, little time is wasted in loading the dust. This is directed by the pilot supervising the work of a number of Negroes. The dust usually is a calcium-arsenate solution, a chemical that has proven quite satisfactory for this work, although a sulphur solution may be employed in severe cases. The dust comes packed in drums of a hundred pounds net weight.

After loading sufficient dust, the pilot takes off and flies to the fields to be dusted. These fields range from five to as many as 1,000 acres. The larger the acreage the easier for the pilot, because he has fewer turns to make. The actual dusting is accomplished at an altitude of from one to five feet above the crop, depending on the desires of the planter. The application of poison usually is from five to ten pounds to the acre, this also at the discretion of the planter.

Approaching the field, the pilot lines himself up with the proper direction of his row or swath and throttles back to the proper cruising speed. This ordinarily is as slow as possible to effect a more even and complete coverage and prevent "boiling" of the dust caused by excess prop wash. As the ship passes over the end of the patch the hopper door is opened to the correct space to allow the estimated poundage per acre to go through the venturi.

The pilot now must plan his rows as to length, width, straightness and also be watchful that his hopper agitator functions properly so as to prevent clogging at the door. But, most important, he must constantly be alert for stumps cotton houses, cypress snags and any other obstruction that might appear in his path.

Approaching the end of the field the throttle is opened to gain speed for the climb and turn, the hopper door is closed as the ship leaves the field and the turn is started, usually a normal climbing turn. While in the climb a reverse turn is negotiated in such a manner as to

(*Continued on page* 82)

THE Man UNDER THE Hood

LEAVE it to the foreign publications to dig out our military secrets . . . a little Belgian aviation paper turned up the other day with three-view drawings and a description of the "secret" **Vultee XP-48** . . . more surprising than the drawings themselves, though, was the presence, in one corner, of the official **Vultee** trade mark which appears on all factory drawings! . . . we knew about this ship but held off on the story at the request of a military official—and got ourselves scooped . . . what the Belgians missed, though, was the fact that the **XP-48** will carry 10 machine guns . . . four in the wings, two in the nose and four in the tail firing backwords . . . they're electrically operated by a selector switch and the pilot fires them separately or together . . . incidentally, Vultee also has a rather conventional ship on the way . . . called the **BC-51** (basic combat) . . . powered with a 600 h.p. engine . . . gas will be carried in whole leakproof wings. . .

* * *

Benny Howard isn't the only one thinking seriously of going into production on an aerial box car . . . another aviation veteran is working on the same idea . . . he's **Bill Stout** of tri-motored Ford fame who is reported to be working on a streamlined version of that venerable airliner . . . as a freighter, the ship is expected to carry 8,000 pounds . . . a Detroit group, we hear, is thinking seriously of going into business with the ships. . .

Bill Stout

* * *

We have it from an unimpeachable source that **General Heinrich Milch,** former head of Luft Hansa and now head of the German air force, is the son of a Jewish father . . . it's supposed to be an open secret around Berlin that, when pressure was brought to bear on **Milch's** mother, she signed an affidavit to the effect that **Milch** is the product of an Aryan suitor . . . this because **Milch** is too valuable a man to lose. . .

* * *

Dick Grace, the former movie stunt pilot, is expected to start a nation-wide tour crashing ships . . . after which he expects to retire permanently to a life of writing in his California home. . .

* * *

After all the hubub over the Frenchman riding in that secret **Douglas** attack-bomber, the **Douglas** company didn't even enter the ship in the recent Army competition . . . instead, that firm got an $11,000,000 order for 100 of the ships . . . **Glenn Martin,** incidentally, also has an $11,000,000 order from the **French** for 115 copies of the export version of that **Martin** attack-bomber shown in the last issue of POPULAR AVIATION . . .while we're discussing that **French** shopping tour, did you know that they also gave **North American** $8,400 000 for 200 trainers and **Pratt & Whitney** got a $9,100,000 order for engines? . . . and we've already told you about the $5,000 000 order for 200 fighters that **Curtiss** got. . .

* * *

Not long ago, we understand, certain **Army** and **Navy** aviation higher-ups warned engine manufacturers that the huge circular radial engines wouldn't fit into the military aircraft plans for the future . . . all because those engines present so much frontal area as to slow down an airplane considerably . . . naturally, the engine manufacturers went into a dither . . . during a conference on the subject at a certain engine plant, a young engineer employed by that company is said to have walked in with a solution to the problem . . . at first the older engineers wouldn't even listen to him . . . however, when their ideas ran dry, they called the young fellow in as a last resort . . . the youngster's solution: move the standard radial farther back in the fuselage, streamline the nose perfectly and simply attach the propeller to a lengthened shaft . . . the older men said it would be impossible to cool the cylinders . . . the young engineer finally won his way and a standard **Curtiss P-36** was rigged up in that manner . . . a test pilot took the revamped ship up and came down with the report that the ship was a little faster than even the powerful **P-40!** . . . added humor: the test pilot complained that the young engineer's cooling system was too good; that he couldn't keep the cylinders hot enough! . . .

* * *

Newest **Lockheed** commercial project has been named *Excalibur* . . . it will be equipped with a tricycle landing gear, four engines, will seat 21-28 passengers and will weigh 25,000-30,000 pounds . . . it's slated to be ready by 1941 . . . meanwhile, Douglas has a similar ship scheduled: the **DC-6** . . . this probably will be the same general size as the **Lockheed,** have four engines and tricycle gear. . .

* * *

Consolidated down at San Diego has a super seaplane coming up which, if true, will top anything you've ever heard of . . . remember that 17-foot propeller so widely publicized some time ago? . . . we hear now that that prop was intended for this ship's 2,000 h.p. air-cooled engines . . . from what we can gather, the new **Consolidated** will be a twin-engined job, will carry about 50 persons in its two decks, will carry several thousand gallons of gas and—most breathtaking of all—is supposed to have a cruising range of close to 10,000 miles! . . . cruising speed is said to be close to 200 . . . both the **Navy** and certain airlines are interested in this design . . . **Consolidated** is staking a lot of its future on the success of this ship. . .

* * *

Northwest Airlines and the **Lockheed** company had a run-in as the result of that accident on January 10, 1938, near Bozeman, Montana, in which a "14" suddenly lost its tail . . . an agreement on this situation was reached on January 27 of this year which reads ". . . in consideration of the cancellation of the Northwest Airlines, Inc., claim for consequential damages and placing an order for a Model 10 *(Electra)* Lockheed transport [the Lockheed] company agrees to buy at $65,000 each, eight of Northwest Airlines, Inc. Lockheed Model 14 transports, if the airline desires to sell them, on or before July 27 1939" . . . to date **Northwest** has not asked **Lockheed** to buy back any of the ships. . .

* * *

Inez Gibson, a California ladybird, is said to have purchased a **Northrop** attack-type monoplane and is preparing it for the annual **Bendix Trophy Race** in September . . . the ship has retractable gear, complete blind flying equipment and plenty of space for fuel . . . **Max Constant** is teaching **Miss Gibson** instrument flying . . . incidentally, **Jacqueline Cochran** will enter the **Bendix** only if she can get a ship as fast as the best entry. . .

Inez Gibson

* * *

Odds and Ends . . . While **Benny Howard** is Douglas test pilot on the **DC-4** only, **Ralph Johnson,** former United test pilot, has been named to replace the late **Johnny Cable** . . . the **Army Air Corps** has just acquired land for air bases in Porto Rico and Alaska . . . **Lockheed** sold seven "12"s, 15 *Electras* and 77 "14"s during 1938 . . . the **Wright** company has a new series of *Whirlwind* engines (sleeve valves?) coming up soon . . . blind landing systems have been authorized for five airports on **United Air Lines'** route . . . **United,** incidentally, today owns 35 Douglas DC-3 and DST transports and 17 Boeing 247D's . . . is that unusual-looking single-engined tricycle-geared fighter down at Wright Field the one built so secretly by **Bell?** . . there's that new **Cessna** coming up: it's a low-wing cabin job, carries two pilots and three passengers, uses two 225 h.p. Jacobs engines, will sell for about $25,000, will gross 5,000 pounds and should hit 200 m.p.h.

END

WINGS FOR

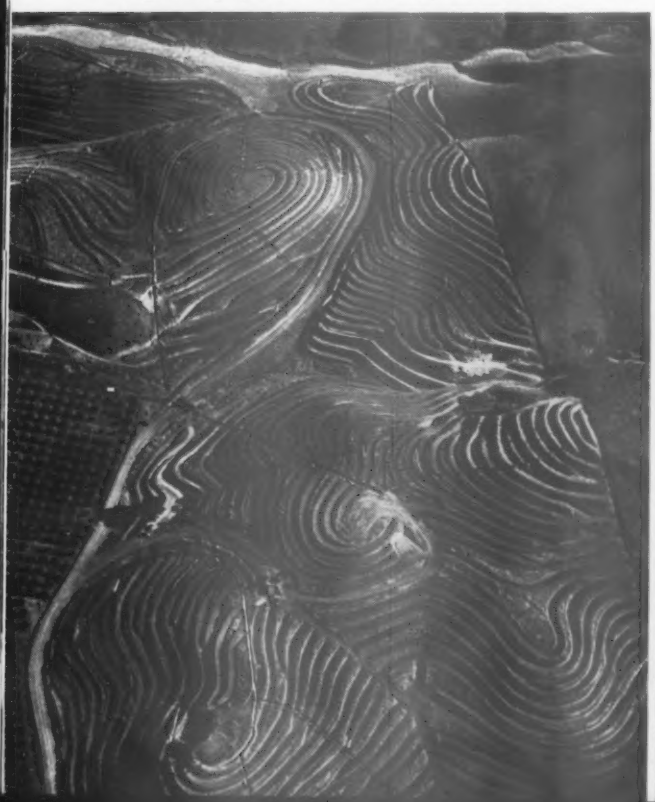
Photographer and pilot prepare to take off for a day's high-altitude shooting.

IT has been said that the next great war will be fought and won in the sky. The present conflict between man and erosion is being fought on the ground but to win it soil conservationists are taking to the air. If we as a nation are to enjoy future prosperity and our agricultural lands are to continue to produce abundant crops, we must win this present war between man and erosion for, in all seriousness it can be truthfully said . . . "to the victor belongs the soil."

To save our fertile acres and bring about a national "conservation consciousness" the United States Department of Agriculture through its Soil Conservation Service has established demonstration projects in 11 regions throughout the country. The real purpose is not to attempt to cure all the ills of all the farmers but rather to educate those who till our soil and the general public as well in the wise and conservative use of our two basic resources, soil and water. To establish projects, reconnaissance surveys followed by detailed maps must be made and here is where the airplane performs its first service, for soil men and engineers must have these facilities made possible by the airplane. For them, aerial photography means the quickest, most accurate and least expensive method of mapping.

Dr. Stanley W. Cosby, head of the California-Nevada region of the Section of Soil Conservation Surveys, is enthusiastic in his statement regarding the value of the airplane in his work although he also appreciates the fact that the making of aerial maps must be followed by accurate detailed ground surveys. "It is our hope never to have to attempt a survey of any magnitude unless satisfactory aerials are available for our use. The finished observations made through the use of the airplane are a great saving in time and money. Soil Conservation Surveys made without aerial maps cost two to three times as much," Dr. Cosby stated. To him the airplane is a valuable facility which permits adequate reconnaissance, selection of problem areas and review of work accomplished.

To fill the needs of the Department of Agriculture for the SCS and other bureaus in all of the 11 regions called for the biggest job of aerial mapping that had ever been undertaken. It meant that planes manned by aerial photographers would fly over every state and county of the entire nation, mapping every town and farm, hill and valley. The largest of these surveys was carried out by the Fairchild Aerial Surveys, Inc., who mapped 25,560 square miles of watershed in the Hopi, Navajo and Zuni Indian Reservations of Arizona, New Mexico and Utah. This was the largest mapping job ever done in the United States and it required 300



Seen from the air, this bench-terraced hillside looks like a giant fingerprint. Citrus trees are planted on each bench.

Photographs such as this vertical shot of the Camarillo Hills district in California are invaluable in spotting eroded areas.

MEN OF THE SOIL

by ROD RADFORD

The airplane and the camera combine to make one of the most useful teams known to mankind. Soil conservationists have accepted the airplane as indispensable.

hours in the air over a six-months' period for completion. Similar work was being done by 40 or 50 other planes in various sections of the country, each turning in its part of the finished picture which, because of its gigantic size, will, of course, never actually be assembled in one print but will be made up of some 333,000 photographs, each two feet square. As these are completed they are turned over to the Washington office of the service for distribution to the field where they are used immediately in the planning and development of projects.

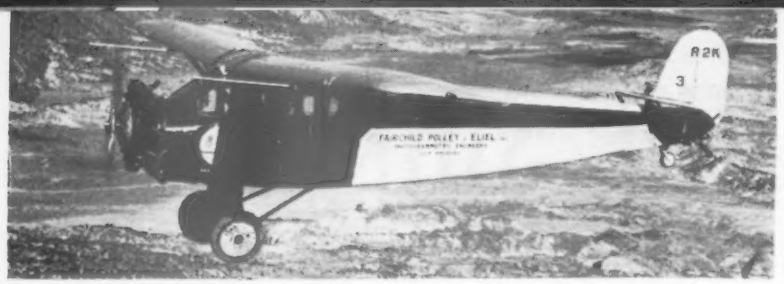
To some men who have spent their lives on the ground and have developed the viewpoint of the caterpillar these maps would be meaningless and a trip by air would be a total loss, as from this new position high above the usual point of view they are unable to pick out objects with which they are ordinarily familiar. To the engineer or soil man, maps are like hammer and saw to a carpenter and when he takes to the air with a project map across his knees looking from the window of the plane he sees below him the inter-relationship of the erosion problems, control measures or soil types indicated on his map as though he were viewing a gigantic enlargement with perspective added.

It was stated by one soil conservationist that he had obtained a better understanding of a project from a five minute trip in the air than he had been able to get from months of ground observations. An entire watershed from its start in the foothills across the valley floor to the sea, was taken in at a glance. A burned area from which excess run-off water was to be expected was spotted instantly. Acres of clean cultivated land high above the vision of the man on the ground came into view. These fields, if left unprotected during the rainy season would lend more than their share of silt laden water to flood drainage channels and rivers. Such observations pointed to a stronger dam here and a more dependable revetment wall there to make the project control measures successful in operation. To have arrived at a similar conclusion from a ground inspection would have taken days and then the overall picture showing the part played by the various units would have been lacking. This picture of the entire region as a whole is invaluable to a Regional Conservator. The details of a soil conservation program are all important but to the man responsible for the success or failure of this program, details are not of primary concern as they are handled by the various section heads and project managers. He has neither the time nor capacity for personally inspecting each rill and gully or each structure being built by his project technicians. He must be able to form a mental picture of the problem and its control dealing with the important general aspects. Here again the airplane provides a much needed service.

In carrying out a soil conservation survey in the best and most efficient manner an aerial reconnaissance is first made. This makes it possible to cover quickly large areas that on the basis of their aspects seem to justify more intensive treatment. Next the aerial maps are made. Provided with these a ground party makes a survey in detail, inking

Here the sharp-eyed aerial conservationist caught a picture of a land cancer that already has done damage estimated at $20,000.

This is the equipment inside an air-mapping plane. The camera shoots through the floor and is operated automatically for maps.



This is a Fairchild Aerial Survey plane flying a Colorado soil conserva'ion mission.

in symbols on the maps which to the trained user stand for types of soil, forest cover, vegetation, water facilities, etc. Lastly, after completion of these maps they are taken into the air where the entire area is again studied, but this time with the added detailed information filled in by the ground crew. By this method a true understanding of the problem can be gained.

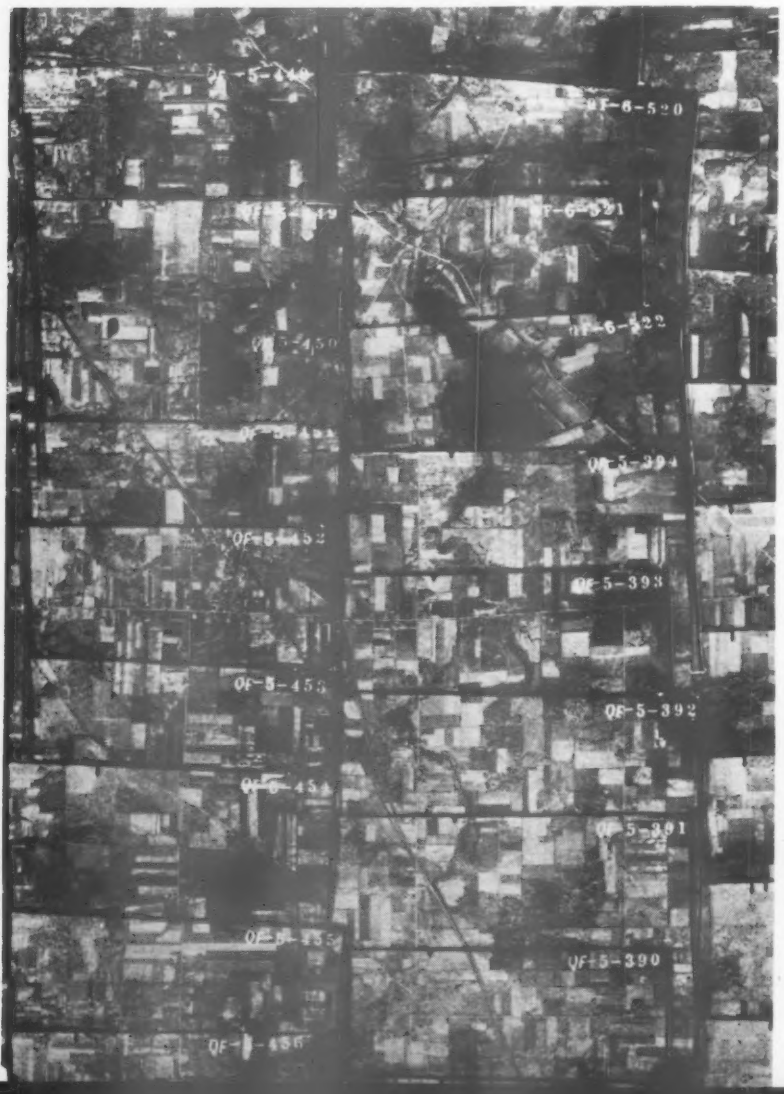
In some regions when projects are getting under way and sites for future work have been selected, the regional photographer will fly over the area on which work is to be done for the purpose of making preliminary photographs which will be used with later photos as "before and after" records of progress. Many of these photos are also released to the press by the Section of Information since they present areas familiar to all in their vicinity but from a viewpoint that is available to relatively few persons.

Often "opportunity" photographs—pictures which must be made immediately while the condition exists—can be made best from the air. On one occasion the photographer in the California-Nevada region flew up and down the Santa Clara River valley photographing the record number of land slips which occurred during a prolonged rainy season. There were more slips to be seen within a radius of a few miles than had occurred in the area during the past several hundred years, according to estimates made by a soil scientist.

One early morning, residents of Santa Paula were awakened by the smell of smoke and the screech of fire sirens. A 12,000 acre brush and grass fire was stripping away the protective cover of the entire watershed above a demonstrational area just south of the city. This meant that during the months to follow, dams calculated to control certain gullies and withstand a specified run-off would now be required to handle an increased load as flood waters would hurtle down canyon slopes using the ash covered watershed as a toboggan. This fire would have a far-reaching effect on the success of the structures and erosion control systems being demonstrated in the area. The pilot of the contract plane was hurried out of bed and together with a photographer flew over the fire zone. A photographic record of the affected watershed was made and from these photographs it was possible to estimate the extent of damage. Immediate plans were laid to provide a protective covering of vegetation for the sections from which all brush and grass had been burned. Field surveys were made and almost before the slopes had cooled government men were re-seeding the hills and planning emergency controls which would be needed in the event of another heavy rain.

During California's worst flood in 40 years increasing rainfall on land already saturated, caused thousands of tons of rich crop producing topsoil to be washed from clean cultivated slopes. Rain fell in seemingly impossible torrents transforming small gullies into yawning chasms in the span of minutes. Soil laden water filled outlet ditches to capacity and overflowed their banks spreading out over valuable crop lands on its race to the sea. This extra burden of soil and water gorged the river channels. Their courses were changed completely and lashing from side to side muddy waters tore at unprotected banks cutting away block long strips of prize orchard land eating back at the rate of five or six feet a minute. Tree by tree, row by row, whole walnut groves that had been producing crops from 15 years, toppled into the river to be swept away. As quickly as weather conditions permitted and damage could be repaired a plane took off from the Santa Paula airport where shortly before the runway had been covered by two feet of water and spread over with a layer of slick silt. It followed the course of the Santa Clara River now widened in spots to three times its original size, to the ocean. From above, the deposit of soil in the

(*Continued on page* 84)



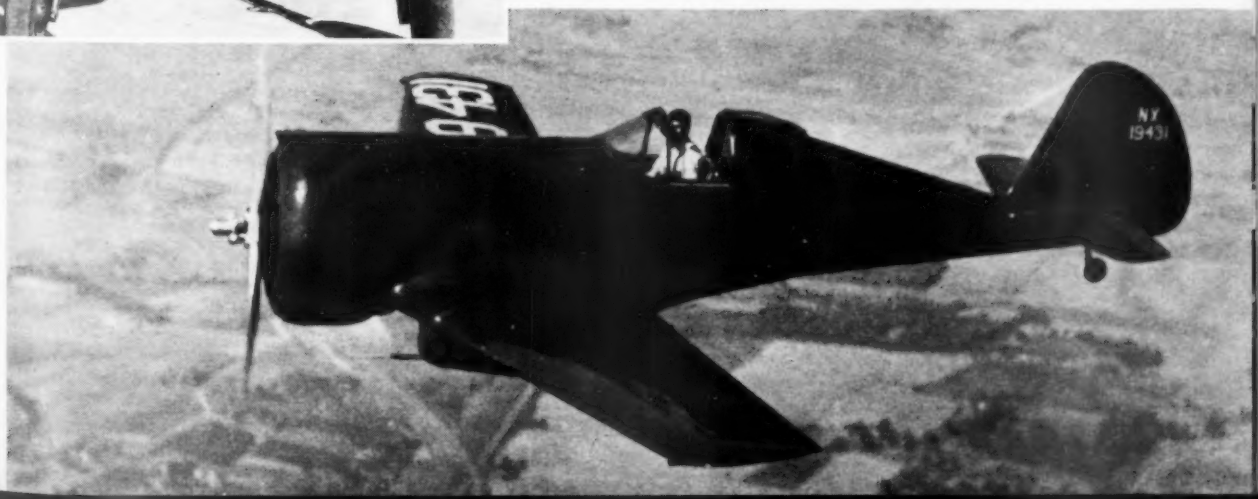
The overlapping vertical photographs are pieced into a map. Above is a single shot.

Curtiss' "anti-bomber" can disappear in 90 seconds.

5,000
FEET PER MINUTE!

ANYTHING that goes up as fast as the Curtiss-Wright "21" is bound to attract attention in military circles. For years, the British have made much of their interceptor-fighter classification. This is perhaps the first time that a truly American ship in the same category has been produced—and many air experts who have seen the Curtiss ship say it out-Britishes the pioneering British. The "21" is powered with a 1,000 h.p. Wright *Cyclone* engine, is especially designed for ease of maintenance, has retractable landing gear and carries two synch.onized machine guns. Intended to ward off high-flying bombers, the "21" climbs out of sight into a clear sky within 90 seconds—which is about 5,000 f.p.m. Many tests have been flown with the ship at the company's St. Louis factory and they have found its top speed to be over 300 m.p.h. We have had several reports that both the Chinese and French have been interested in the "21" for possible additions to their air forces.

Certain foreign purchasers are believed to be interested in buying quantities of this revolutionary new fighter for their air forces.



Though this Lockheed XC-35 stratosphere ship was a secret, cameramen got pictures on local airports.

Spies-1939 STYLE

THIS is the story of the Great Spy Scare of 1938-39. Because the activities of the espionage gentry—real or imagined—have been so widespread during the past 18 months, we shall confine ourselves to that happy-hunting-ground of funny folk, southern California. For here flourish some of America's largest aircraft factories, prime targets of mid-Twentieth Century spies who bend their most ambitious efforts toward the task of purloining plans for super-bombers and swift fighters.

From each new outbreak of true or pseudo-espionage, the War and Navy Departments have obtained added justification for their clamp-down on information which hitherto trick'ed pretty freely from official sources. The spy scare has provided the playing pieces for as handsome a jigsaw puzzle as you have ever seen.

The puzzle's parts include everything. There was a poor, confused psychopath who believed himself ordained by the "International Police" to filch plans for an export-type bomber that anyone could have had for the purchasing. But there also was a young American trying to earn a dishonest dollar selling specifications of a dive-bomber to Japan.

And there were the newspapers. In the eyes of the War and Navy Departments, journalism sometimes comes annoyingly close to petty espionage. Military secrets, they believe, are occasionally treated too lightly. Funny how thin a hairline divides what you can do and what you can't when you're dealing with the Army and Navy. I know. For I covered many of the spy and most of the aviation yarns of the past two years in southern California.

Funny, too, the ridiculous surprises you bump into where you sniff around Federal "secrets." Surprises that have sequels. Here is one case:

Less than two years ago, on a wind-swept little flying field adjacent to the Lockheed Aircraft Corporation factory at Burbank, a dozen men were pushing a strange-looking airplane into position on the runway. Patterned closely on transport lines, it was bulky, windowless, narrow-winged. Its engines appeared super-powerful and they unleashed an incredible din. This was XC-35, built for the substratosphere, destined for the Army Air Corps. For weeks the newspapers had sought some publishable information on the craft. But data had been curtly denied. Photographs were out of the question entirely.

One enterprising news cameraman, however, with more industry than good sense, polished up his twelve-inch Big Bertha lens and hied himself to a railroad embankment a quarter-mile from the Lockheed testing grounds. When XC-35 glinted in the sunlight for the first time, the photographer calmly clicked his shutter. One, twice, thrice. Three good pictures, one of which, appearing in a local paper next morning, sent the Army inspectors into a wrathful dither. Guns flashed openly in the hands of plant guards the following day. And the sequel? At this precise moment, several thousand miles from that little airport in Burbank, an Australian newspaper was printing in color and in exact detail a full page sketch of XC-35. Its editors had mysteriously obtained the desired information, and proceeded to prepare an excellent aeronautical news scoop. I know this to be a fact. I saw a copy of the Australian journal. In one hand I held that exasperating "beat" of my Down-Under rival. In the other I held a clipping from my own paper of a few months earlier which read: ". . . plant guards were instructed to shoot cameras from the hands of any trespass-

This Stearman bomber was a secret Army entry but got snapped at a public field.

Although this XP-38 was strictly hush-hush, it was flown coast-to-coast and crashed publicly.

by JAMES BASSETT, Jr.

Here is the latest on the espionage bugaboo. Military men are so jittery they even suspect box camera fans.

ing photographers and to make sure that all films were destroyed."

There are today a half-dozen equally secret aircraft underway for the Army and Navy throughout the United States. Some are too large to hide comfortably. One airport stroller in five carries his little candid camera—and to most casual spectators regulations are unknown quantities. They snap pictures of confidential equipment as unconcernedly as they film departing celebrities. And who is to tell if the amateur photographer is a Japanese, an American or a Hindu?

Take that torpedo-bomber a newspaperman sought to picture last year in Los Angeles.

"Put away your camera, buddy" he was warned. The buddy did. But later he learned to his intense chagrin that sisters of this selfsame ship were en route to foreign countries by the dozen. It is inconceivable that a news photograph of an airplane could betray enough aerodynamic information for even the most skillful engineer to copy the original.

Yet the spy-scare censorship continues. While many a genuine loophole that ought to be plugged remains, such things happen:

A hydromatic propeller developed for the Navy lay on the "secret list" for weeks after commercial airlines began using it. Describing that prop—for a newspaperman—was a Federal offense. Meanwhile transports wearing this allegedly secret propeller stood on runways from Los Angeles to Boston for anyone and everyone to stare at; and even publicity releases concerning its safety advantages were, for a while, taboo.

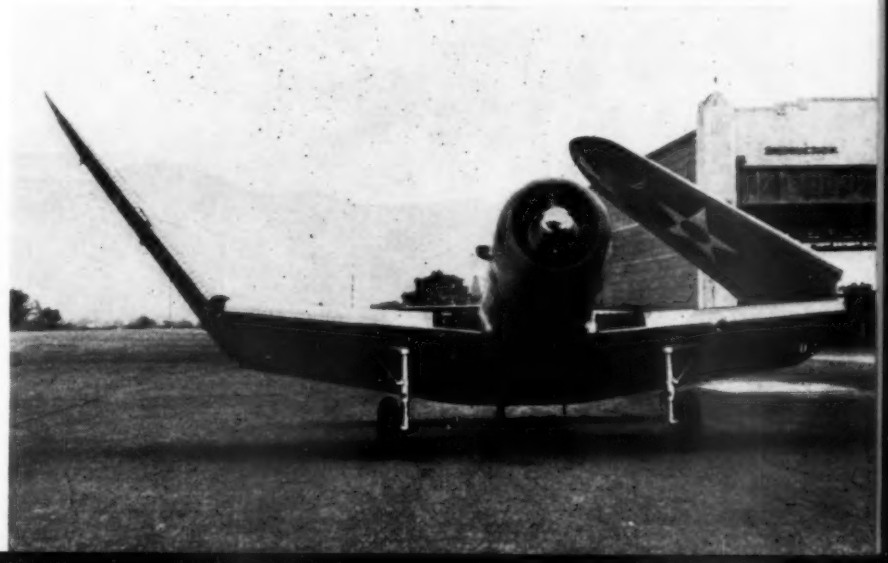
Then there is a classic story of the visit of a German admiral to one of the United States Navy's newest warships in Los Angeles harbor not many years ago. With his practiced eye missing nothing, the Teuton seaman was escorted on a painstaking tour of the dreadnaught. Then came time for the inevitable photographs. The battery of newspapermen trained their lenses on the German and his American hosts. As they were about to flick their shutters, an aide dashed into the foreground, arm raised.

"Just a moment, gentlemen," he said. "We must take this photograph elsewhere. Just behind us is a highly secret seaplane catapult. We would not care to have it pictured!"

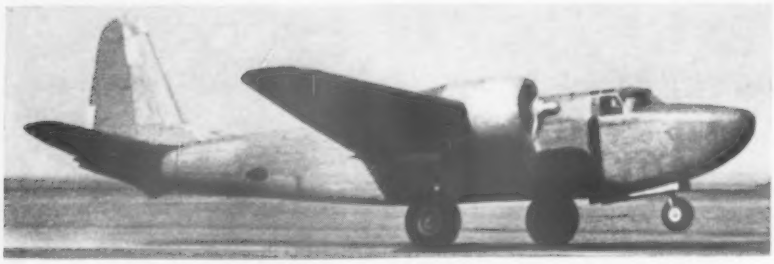
Probably plenty of reason exists for censorship and the unending search for spies. Evidence *has* been uncovered pointing to the presence within the walls of the United States of agents of foreign nations. But to external appearances, we have, largely, caught only the small-fry. Much of the stuff on the government's Don't-Print lists is already well known in aeronautical circles. And what is chit-chat fodder in cocktail lounges certainly lies in the alert alien spy's notebook.

But new rulings spring up almost daily. Not long ago the War Department issued a blanket order to every aircraft company handling Air Corps orders that henceforth publicity on new contracts, backlogs, production prowess and specifications must cease. Perhaps they have their reasons for this. Arguments could be made on both sides. But to many an observer it appeared that the Army was cutting off its nose to spite its face: clamping down on the sort of information which ought to warn other nations that America is Ready-and-Able.

To keep out the threat of espionage, the Lockheed factory hired a topflight expert in tracking down criminals—John Hanson, chief of the Federal Bureau of Investigation in Los Angeles, who resigned his government sleuthing to enter



This Douglas TBD-1 is "secret" even yet. Here are its secrets on a public airport.

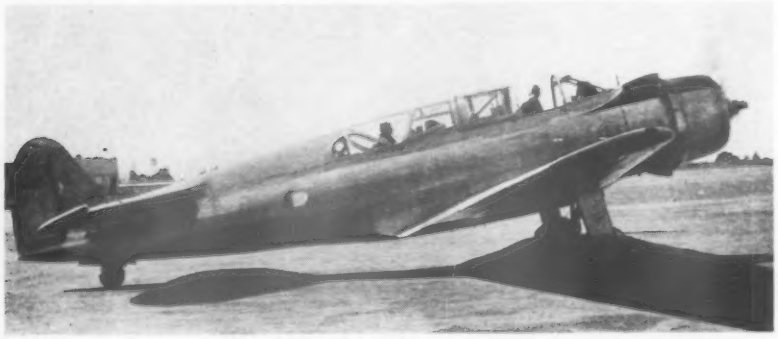


Although this Douglas attack-bomber was supposedly closely guarded, plenty of pictures were gotten of it. This is the ship that crashed with a French aviation officer aboard.

This converted Lockheed "12" was kept quiet, probably because of the novel three-wheeled landing gear installed. Notice that this ship bears a commercial NX license.

Following the crash of the Douglas at the top of this page, this one was built for the recent Army competition at Wright Field. Finally, though, this ship did not compete.

Photographs of the Army's new Vultee attack ship, the YA-19, were not as taboo as those of other airplanes. This ship is more conventional than other "secret" designs.



the aircraft game. Hanson now is "systems analyst" for the Burbank plant. Nothing happens at Lockheed that his keen eye does not first scan. That is good. Yet, on the other hand, *such* events occur:

In a tragic test flight, the twin-engined tricycle-geared bomber that Douglas was grooming for the recent competition at Wright Field crashed and burned a few weeks ago in Los Angeles. Pilot Johnny Cable, a veteran who fought his way upward from barnstorming in Iowa to the No. 1 spot in the nation's largest aircraft plant, was killed. But his "mechanic" lived.

The latter proved to be Paul Chemidlin of Paris, France, an aeronautical attaché of the French Air Ministry riding as supercargo in a "highly secret" craft with Federal permission. Since the Douglas was still a-testing, its cabin was free to anyone whom the factory and the Army okayed.

But—it then appeared that an agent for a foreign nation had access to material which might in the near future be a weapon of American defense. Not that France is unfriendly. Far from it. But the principle remains. While a European was observing the inner workings of the Douglas bomber, newspapermen were denied even the knowledge that the craft existed. (POPULAR AVIATION's Man Under the Hood, however, had scooped the world on the presence of this revolutionary-type machine several months ago.)

Recently I attempted to gather a few generalities concerning a forthcoming Army fighting ship for a news yarn. I might as well have asked Prime Minister Chamberlain for news of the Duchess of Windsor. This satisfaction I did receive from one factory official:

"Why don't you subscribe to the *International Aero Press* or *Inter-Avia?*"

Then he explained. *I. A. P.*, edited by shrewd Dr. E. Rusman of The Hague, Holland, probably is the best informed technical aviation periodical in the world. It contains information about American aircraft, for example, which newsmen in the United States might attempt unsuccessfully to obtain for years. How Dr. Rusman assembles his international tidbits nobody knows, unless he maintains a colossal spiderweb of correspondents throughout the world. *Inter-Avia*, published at Geneva, Switzerland, is only slightly less informed on supposedly secret aeronautical data.

Sometimes, however, there are real spies. A few months ago in Los Angeles a blond-haired, lean young fellow who looked like a cinema juvenile heard himself sentenced to two years in a Federal penitentiary and deprived of his citizenship. Karl Allen Drummond was a checker in the Northrop division of the Douglas corporation. He was a model young man, good to his parents, fond of his brother, anxious to succeed. But perhaps Karl was *too* anxious to make his mark. For he became a spy.

With absurd ease, apparently, this youth stole enough blueprints and photographs of a powerful new Naval dive-

(*Continued on page* 64)

Personalities

E. Rawdon Smith has been named publicity head of Britain's Imperial Airways.

New Vultee representative in South America is Norris Mumper. He now is on tour.

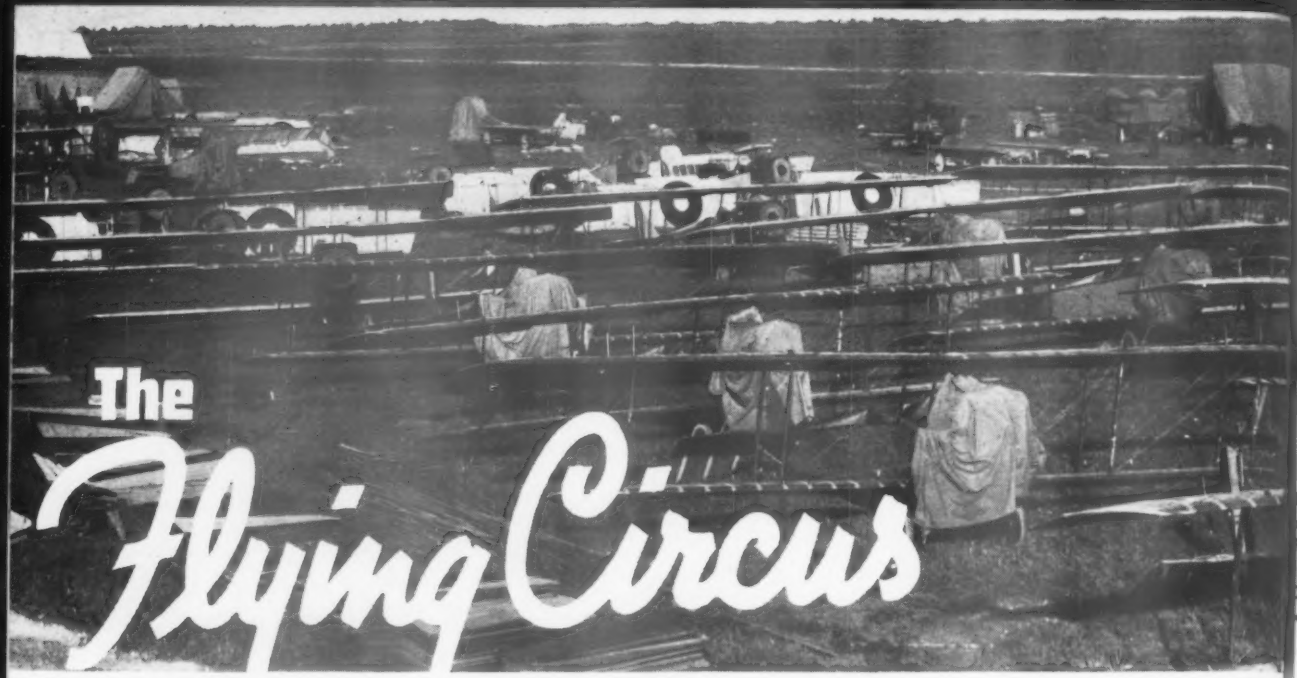
Successor to TWA's late chief pilot, Harlan Hull, is handsome young Otis Bryan.

Miss Ya Ching Lee, Chinese girl flyer, is touring the U. S. seeking war funds. She is shown at Miami being greeted by Rudolph Friml, the composer.

Edmund T. Allen (right), noted test pilot, now is helping Johnny Wagner (left) with some Vultee test work.

Emmarie Gibbs, Braniff stewardess, got this 50 lb. tarpon on her recent vacation.

Dapper Col. Roscoe Turner recently was selected by a group of New York beauties as "America's best looking aviator". Some of the girls are herewith toasting his success.



The Flying Circus Passes On!

by GEORGE R. REISS

The barnstorming pilot has almost faded from the American scene. But American aviation owes much to those happy-go-lucky daredevil aces.

Barnstormers got most of their planes from Government overflow lots like this.

This barnstormer's engine quit on the take-off—just part of the day's work.

RECKLESS, colorful, romantic men they were—men whom the conservatives might term mad and the romanticists might term adventurous; and the men of the old flying circus "barnstorming" days were a bit of both, with a dash of canny business sense and showmanship mixed in for good measure.

They lived fast and dangerously. They drank and they loved and they fought and they took their good times when and where they found them. They died, when their turns came, with grins curling their cynical lips. Today they rolled in money and tomorrow they skipped meals, tightening their belts to ease the aching void. They accepted any decree of fate with equal good-natured rollicking nonchalance.

It was an unhealthy profession—that flying circus profession. Not one for the cautious conservative, for the "home guard;" but one for the reckless, mad gambler who would wager his all, even his life, on the decree of fate. It was a profession of short but full lives, one of uncertain and precarious existence, with doubtful reward at the end. It was an era in aviation history of fragile, dangerous, doubtful airplanes and of superb pilots who, given enough power, could fly the barndoor and make it do aerobatics.

These men of the flying circus days wrote a romantic, thrilling chapter—and a highly important one—in American aerial history, a chapter which paved the way for America's widespread system of large airlines, top-notch flying schools, superbly equipped local flying operators, and the wide acceptance of private flying.

The flying circus of the barnstorming days was a colorful aftermath of the World War; purely an American insti-

Last stand of the barnstorming and flying circus days is epitomized by Clarence Chamberlin, who's still doing well.

tution, as American as the river showboat and the medicine show and the county fair. No other nation knew the excitement and the thrills and chills of the flying circus as did America's hinderland.

It introduced America to the airplane, it demonstrated the uses and speed and versatility of the airplane—and it forcibly made clear the threat of military aviation. The flying circus was truly America's No. 1 aviation salesman.

Today, it's work is done. Today, the flying circus as the 1920's knew it is dead—a victim of stringent federal regulation designed to make aviation safe; of business depression, and the familiarity of the airplane.

But, from this hazardous profession have emerged some of America's outstanding aviation figures. Many of the barnstormers still fly, their pioneering days having brought them success in aviation; others have climbed down from their cockpits for the more prosaic professions. Still others went to their deaths in the dangerous days.

Some of the better known of the flying circus figures, many of them still living, are Ivan R. Gates, probably the greatest of the flying circus ballyhoo artists; Clyde E. Pangborn, of round-the-world flight fame; Charles A. Lindbergh; Basil L. Rowe, chief pilot of Pan American Airways; "Duke" Krantz, now pilot for the New York *Daily News;* Marshall C. Hoppin, now division airport engineer for the Civil Aeronautics Authority at Chicago; Lee Mason and Bill Brooks, who wrote a thrilling chapter for aviation in a Nicaraguan revolution; Clarence D. Chamberlin, still a barnstormer on a bigger scale; Horace Stark, now an airline pilot and aviation inventor; Roy Ahearn, Jack Ashcraft and

Even the ladies took part. This lass was noted for her wing-walking and 'chute jumps.

The barnstormers often made a little extra money loaning their ships for auto ads.

Most flying circus equipment came from surplus stock of Government Curtiss Jennies.

scores of others in all parts of the world.

The Jenny and the Standard J-1 were popular ships with the flying circus pilots in the heyday of branstorming, 15 to 20 years ago—popular because they were cheap and plentiful and were the best ships available. There were Jennies and Standards to burn—and thousands of them actually were burned—ships that had been built as trainers for the World War.

New and still in their original crates, the Jennies and Standards, ships that cost $8,000 to $10,000 each, went begging at $50 to $500. A hustler could make that in a single good afternoon with a little effort and a little luck, at $15 a passenger, $25 for stunt rides.

Airports? Airports were virtually an unknown article. And what the hell? The barnstormers would have disdained to use them, were they known. They used instead any smooth, level, pasture field—and a lot of pasture fields that weren't so smooth nor level. A free ride for the owner usually paid the field rent for a week.

Repairs? Repairs didn't bother the pilot handy with his tools—and most of these barnstormers were. A roll of baling wire, an armful of ordinary house lathing, a couple of lengths of pine two-by-fours, a handful of six-penny nails, a few sheets of plywood stripped from an abandoned packing box—and a handy guy could patch up a cracked-up Jenny as good as new. Well, practically as good as new. And there'd be no Civil Aeronautics Authority inspector snooping to slash holes in the fabric, either.

Truly it was the heyday of rough-and-tumble aviation. The wonder was not that so many died but that so many lived through it.

The greatest and most legendary of the flying circuses, of course, was the Gates Flying Circus, headed by the fantastic Ivan R. Gates. It was a big business.

In a half dozen years it "made" most of America's cities and towns and villages, carried aloft over three-quarters of a million passengers, and grossed many millions of dollars.

The Gates circus was a combination of creaking old airplanes, two-fisted, life-loving pilots and as wild and reckless a crew of stunt men as ever walked a wing, including Gates, Pangborn, Brooks, Mason, Krantz, Ashcraft, Ahearn and others.

The Gates crew preferred the old Standard J-1, a great wide ship with literally acres and acres of wingspread and a phenomenal carrying capacity. A Standard, powered with a 220 h.p. Hispano-Suiza engine, could stagger into the air with about all the weight you'd care to cram into the cockpit and drape on the wings. In fact, it is said one actually got into the air with 17 persons crowded in the cockpits and hanging on the wings.

"Of course," admitted a Standard fan, "it did take a longer than usual run on the field to get off."

But it was this load-carrying capacity that the Gates crew liked—for already they were putting the business on a mass-production basis. Designed as a two-place job with tandem cockpits, the Standard's front pit was enlarged by gates to hold four persons—two facing forward and two backward — which meant they could crowd in four $15 passenger instead of one $15 passenger. No CAA inspector lifted an eyebrow—because there was no CAA.

Many legends still linger on about the "P. T. Barnum of aviation", Ivan Gates. He wasn't exactly a modest, retiring fellow; and neither was he meek or mild tempered. Instead, he wes loud-mouthed, explosively violent, quick with his fists, prone to braggadocio about his flying ability. Yet he was an extremely popular man and a superb pilot.

There's a story of how he was taken down a peg, but it never cured his temper or his power for self-assertion. One day an argument waxed loud and long about the gliding ability of a certain ship. One pilot contended it could glide from a certain altitude over New York city to a Long Island field. Another pilot asserted it could not. Gates put in his oar.

"I can do it," he asserted loudly. "I'll make you a little bet that I can do it." They took him up on it.

So Gates took up the ship to the prescribed altitude and place, switched off the ignition and put the ship into a long shallow glide. But he couldn't stretch it quite far enough. He landed with a resounding splash in a Long Island swimming pool—and lost the bet, plus a brand new airplane, to say nothing of his temper.

The "stunt men"—the fellows who perilously walked the wings, stood upright while the ship looped, hung from the undercarriage, changed from plane to plane, and jumped with parachutes—were a constant source of irritation to Gates, particularly those inconsiderate and careless enough to get killed, "sticking" the circus with a large supply of printed handbills, advertising their stunts. Thus the circus would have to discard the old bills and have new bills printed.

"$da"34%6&'4," cursed Gates, one day. "These guys are causing us a lot of needless expense."

Then a great idea came to him.

"We'll just call the stunt man Diavalo," he said. "We can always keep the name."

Thus he had a tremendous supply of handbills printed—and each succeeding stunt man was named "Diavalo." Probably the outstanding stunt man who wore the name of Gates' "Diavalo" was "Duke" Krantz, now a cautious, capable pilot who flies the New York *Daily News* photographers and reporters on their assignments but, in his day, one of the most reckless and spectacular of wing walkers.

Krantz hung from the undercarriage, disported himself on the top wing, changed from plane to plane for the extremely modest pay of $2.50 a day. When Gates proposed that Krantz take up parachute jumping, Krantz demurred.

"It's too dangerous," he said. "I'll have to have more money."

"How much?" demanded Gates suspiciously.

They finally agreed on $5 for a daily jump. It was the custom in those days, too, to take up a collection among the spectators just before the parachute jump. One day Krantz had a particularly harrowing experience. His 'chute narrowly missed tangling in the tail of his plane—and that would have meant sure death. He finally landed, pale and shaken. Then a woman pressed through to Krantz, demanding:

"I want my dime—the dime I put in the hat. I didn't see any parachute jump."

The Gates circus used all kinds of ballyhoo. The ships sometimes stunted low over towns, they begged space in newspapers, teamed up with merchants—anything to get a crowd. One flying circus even was accompanied by a steam calliope.

The prices of rides dropped steadily—to $10, then $5, $3, finally $1 with few takers—as years rolled by, and federal regulations definitely brought a close to the circus days. Gates vainly sought to fit himself into the new era of aviation, grown up and ready to take its place with other transportation systems. But he was hopelessly of the past and a discouraged, disheartened man he was. His crushed body was found on the stones below his hotel window a half dozen years ago.

Hoppin, a lanky, rollicking young barnstormer, found himself with too much business back in 1922—and solved it with a neat bit of strategy. Flying a Jenny, Hoppin "made" Shamokin, a

(*Continued on page* 81)

CUB *again passes on to you* New Savings!

Here are the facts: 1. The 1939 demand for Cub Airplanes is far exceeding our anticipated schedule of production. 2. Therefore, our volume of production has gone *up*. 3. Consequently, our unit cost of production has gone *down*. 4. So, we pass on to you new and important savings . . . on many models more than one hundred and fifty dollars. 5. And, in the coupe you get *more* horsepower for *less* money. 6. Moreover, in the new low prices below, effective May 1, 1939, note a new Cub for only $1098 . . . on the easy payment plan for as little as . . .

$366 DOWN

MODEL	ENGINE	PRICE
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Cub Trainer	Continental "50"	1450
Cub Trainer	Lenape "50"	1595
Cub Seaplanes		from 1793
Cub Sport	Franklin "50"	$1348
Cub Sport	Lycoming "50"	1419
Cub Sport	Continental "50"	1500
Cub Sport	Lenape "50"	1645
Cub Coupe	Franklin "60"	1935
Cub Coupe	Continental "65"	1995

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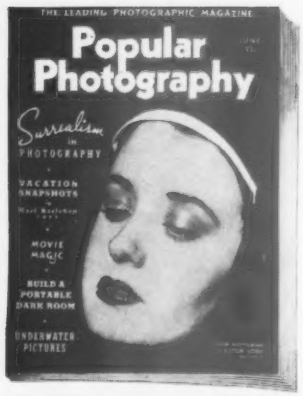

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LET'S GO TO THE CIRCUS. The best way to get your own photographs when you go to the circus this summer.

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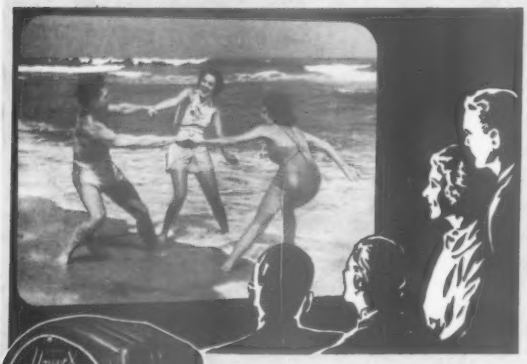
NOW You Can Afford A Movie Camera!



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It's Smart To Own The NEW 1939 UniveX

Spies—1939 Style

(*Continued from page* 58)

bomber to damn himself as a spy in the eyes of Federal law. He and his brother discussed selling them to Japan, the testimony disclosed. But this scheme evaporated when a Nipponese sea captain, the Japanese consul and a Japanese attorney all refused to buy. The latter eventually paid $20 for information relative to America's manufacture of warplanes for China.

Then Karl's brother got cold feet. When the Northrop checker went to visit his parents at Wichita, Kan., he took the whole story to a Naval inspector. So instead of returning to his job, young Karl walked into the arms of the F. B. I. when he came back to California.

The sequel? There is one: Karl's own story which a Federal judge branded as a "fantastic afterthought." Said the disenfranchised convicted spy: "I wanted to show how easy it is to steal such data. I wanted to prove how lax are safety measures in aircraft companies building government planes. My object has been achieved. I am the goat."

Whether Karl's story is fantastic, as the jurist said, or credible, it at least indicates that U. S. aircraft sanctums are far from impregnable—far less so than the Federal mint at San Francisco which was jimmied by a pair of schoolkids.

Meanwhile, *this* sort of thing was also sending newspaper typsetters scrambling for their 72-point headlines: One George Miller, a 28-year-old dishwasher with a glib knowledge of areonautical engineering, was arrested by the night watchman of the Vultee Division of the Aviation Manufacturing Corporation at Downey, Cal. Miller had been discovered crouched in the pilot's compartment of a fully-equipped export-type bomber. At police headquarters he admitted having been an "international spy" for 16 years —since he was Boy Scout age. In 1932, he said, he had been convicted of treason. What's more, acknowledged Miller, he was a member of the "International Police." They took the poor chap to the psychopathic ward of the County Hospital, later before the Lunacy Commission.

Of such stuff—true stuff, silly stuff—is a spy scare made. We undoubtedly have our share of espionage agents. Perhaps *more* than our quota. Since the United States is still a free country, gatherers and purveyors of forbidden information move with far greater ease than they could in the totalitarian States. Yet perhaps Major Al Williams, who is far from being a babe-in-arms, offered some measure of truth when he wrote in his Scripps-Howard syndicated column:

"As a parting shot at the spy scare, I'd like to say that if the foreigners have found any worthwhile aviation secrets in this country, I'll be the first to faint with surprise . . . We've got those foreigners worried, though. They can't for the life of them figure out what we're going to use in place of an air force in case there is war. That's got them stopped!"

END

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True to the transportation tradition of the empire it serves, Northwest Airlines perfects its Seattle-Chicago service with luxurious Douglas DC-3 21-passenger airplanes. The Northwest has always enjoyed the best in transportation. In recognition of this, Northwest Airlines is adding these modern, most proven air transports in the world to an already famous service. Douglas Aircraft Co., Inc., Santa Monica, Calif.

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NORTH AMERICA: American Airlines Inc. . . Braniff Airways . . Canadian Colonial Airways, Inc. . . Eastern Air Lines . . Northwest Airlines . . Pan American Airways . . T.W.A. . . United Air Lines . . Western Air Express . . Wilmington-Catalina Airline . . **SOUTH AMERICA:** Pan American Airways . . Pan American Grace Airways . . **AUSTRALIA:** Airlines of Australia . . Australian National Airways . . **EUROPE:** A. B. Aerotransport, Sweden . . Air France, France . . Avio Linee Italiane, Italy . . C.L.S., Czechoslovakia . . K.L.M., Netherlands . . L.A.P.E., Spain . . L.A.R.E.S., Roumania . . LOT, Poland . . S.A.B.E.N.A., Belgium . . Swissair, Switzerland . . **ORIENT:** China National Aviation Corporation . . K.N.I.L.M. in Netherlands Indies . . Japan Air Transport

The completed model is an exact replica of the popular O-47A in all outward detail.

THIS MONTH'S MODEL

by PAUL W. LINDBERG

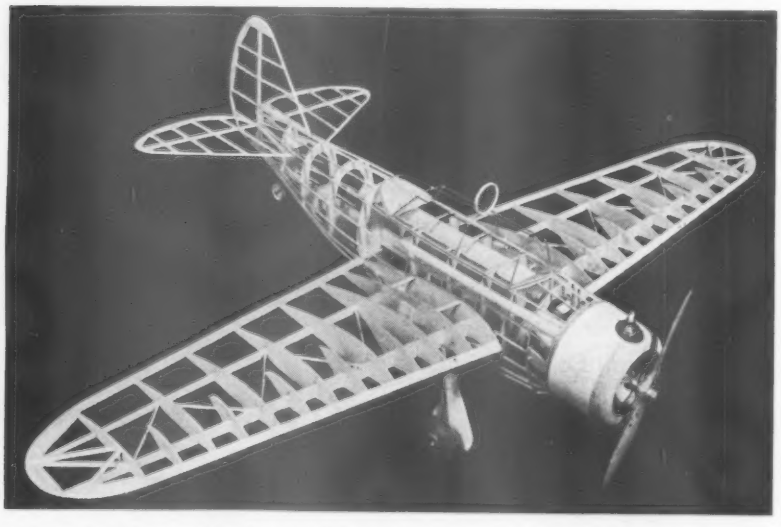
Model Editor and Designer

THIS North American model will prove highly interesting. It combines both beauty with excellent flying qualities. The tiny *Hornet* motor pulls the model through the air at a clip which we are sure will thrill you time and time again. The model is colored in silver with a black patch on top of motor cowl and part way back on fuselage to windshield. Many novel features have been built into this ship such as removable motor mount, removable cabin hood to gain access to batteries, etc. We advise you to spend a great deal of time in building this model and you will be more than repaid for your efforts.

By enlarging the plans four times that shown in the magazine, a duplicate of the model we built will be had.

Construction of Fuselage.

The fuselage is built in two halves with a beam through the center for additional strength. After all the formers have been cut to their proper shape place on a flat surface, edges up. Stringers now are attached from front to rear. Cement these securely. After the two sides are completed, cement them again.



Many novel features have been built into this ship including a removable motor mount.

Construction of Wings.

Cut all wing ribs from 1/16" sheet stock with the exception of rib "A." This must be 1/8" thick. Spars are tapered from 1/8" thick sheet balsa wood. Wing tips are made of 1/8" sheet balsa.

Wings are fastened securely in body as shown in top view of plan. Wings are covered when attached to fuselage as additional strength has been built into them to prevent any warping.

Construction of Tail Surfaces.

These are built upon a flat surface from 1/8" square, 1/8"x1/4" and 1/8" scrap sheet balsa. To add further strength to elevator attach two small struts to under side which in turn are fastened to bottom of fuselage. These are attached after tail surfaces have been covered. Cover tail surfaces before attaching to fuselage. Pin them to some flat surface in order that they will not warp.

Construction of Motor Mount.

Select a good grade of hard wood and cut to the required size as specified on plan. As you will note, to remove entire motor together with mount it is only necessary to unscrew two small bolts in the front and pull out 1/8" dowel at rear of mounts. All other small details are clearly shown on plan which you should have little or no trouble following.

Covering the Model.

Previous mention was made in regard to covering wings and tail surfaces on this model. A good grade of bamboo paper is used for the covering. Attach to the framework surfaces with model airplane cement which has been slightly thinned out. In covering the fuselage it will be necessary to cover in long strips between stringers. This is to assure you of a good covering job. After all the parts have been covered, spray with a light coat of water and let stand until dry. This will cause the paper to become taut. Two to three coats of clear model airplane dope are next applied with a light sanding between each coat. Further coats may be added depending upon the finish you desire.

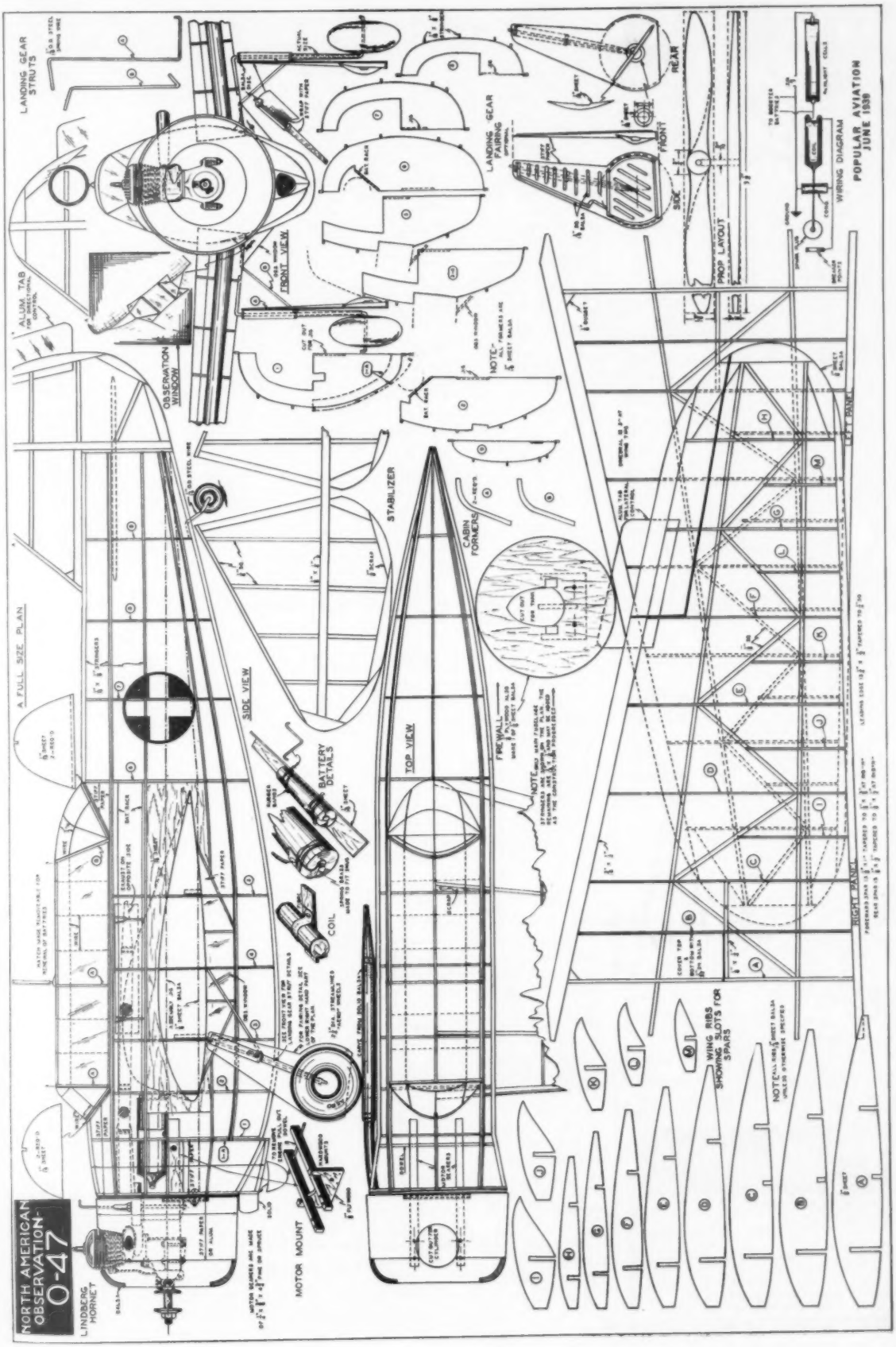
Testing the Model.

Assuming the model is now completely finished with gas, batteries, etc., ready for flight, it is necessary to balance it. Place a finger tip under each wing tip approximately one-third of the distance back from leading edge. Model should rest in a very slight downward position, one or two degrees. If this is not had, shift batteries in rack to secure the proper balance.

Next, launch the model from hand gently over some tall grass so as to prevent any injury to model. This will further give you the proper balance. If model when launched from the hands glides gently to the earth in a slight downward angle, it is properly balanced. Aluminum tabs in wing and rudder are for directional and lateral balance.

Bear in mind to be very careful in balancing your model and running it under power so that you will not damage it on its first test flight. Check everything carefully before launching the model.

END


NORTH AMERICAN OBSERVATION O-47
LINDBERG HORNET
A FULL SIZE PLAN
SIDE VIEW
TOP VIEW
FRONT VIEW
REAR
SIDE
PROP LAYOUT
WIRING DIAGRAM
POPULAR AVIATION JUNE 1939
LANDING GEAR STRUTS
LANDING GEAR FAIRING
OBSERVATION WINDOW
STABILIZER
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MOTOR MOUNT
WING RIBS SHOWING SLOTS FOR SPARS
RIGHT PANEL
LEFT PANEL

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Airline Mechanic

(*Continued from page 27*)

In the other division—aircraft *engine* mechanic—the well-grounded apprentice shouldn't have much trouble. Typical questions are:

"Draw a diagram of a modern multijet carburetor and explain how it works."

"Name three causes for each of the following engine troubles: backfiring, excessive vibration (not missing), lean mixture, rich mixture, overheating and excessive oil consumption."

— or —

"State the regulations to be observed before starting an engine installed in an aircraft; and what is required after the installation of a new or overhauled engine before passengers may be carried?"

It's really a thorough examination and the apprentice needs the knowledge gained from three or four years' work in an airline's hangar before he is able to sit down in the classroom and answer them correctly.

From these you can see that the man who passes his examination is bound to be fully familiar with the work he has to do. Certificates of competency really mean what they say and there is as much pride and satisfaction in earning one as an airplane and engine mechanic as there is in getting a commercial pilot's certificate.

It's reasonable to expect you to be interested in the financial picture. You'd probably like to know just about what salaries are paid in various types of jobs. So before we describe the classes of licensed mechanics it might be well to list the salaries of the preliminary positions. Cleaners start at about 40c an hour. Wages for the Class C apprentices also start at this figure, graduating through Class B to the Class A minimum of 50c an hour.

When you advance out of the apprentice class it is like stepping out of the "plebe" class at West Point. You haven't reached your goal, but you now have the title of mechanic. When the planes come in you are right out in the front, whether it is the overhaul of one of the engines or giving the ship a "line check."

But—even though you now have your certificate of competency—you still are a few steps away from top rank in this profession. For you now are a Class C mechanic. This is the lowest grade of mechanic. You must work up into Class B and Class A before you are a full-fledged mechanic. Your rise from one class to another largely depends on your proficiency and promotional qualifications.

As you rise, your financial reward increases too. Salaries for licensed mechanics range from 60 cents an hour to start in Class C, to the minimum of 70 cents an hour in Class B, and 80 cents an hour at the start in Class A. When you have reached Class A you are a full-fledged airline mechanic and can hold up your head proudly as an A-Number-One mechanic. But there are unlimited possibilities ahead for you even now.

For instance, after long experience in this field during which you have reached high proficiency, there's another job higher up that may be your next step forward. This is the job of inspector. The inspector is a thoroughly experienced airplane and engine mechanic with considerable additional responsibility placed on his shoulders. His salary starts at about $190 a month. His job—as the name implies—is to check on all work to see that it is perfect.

The crew chief is the next step up the ladder in the maintenance field. He ranks the inspector and is responsible for the work turned out by all of his men. Regardless of the fact that one of the mechanics may have initialed a piece of repair work as completed and in working condition, it is the crew chief's responsibility to check and see that the repair work *has* been completed properly and *is* in perfect working condition. His responsibility is not limited exclusively to repair work, however. It is his job to know that the proper amount of gasoline is in the tanks when the plane taxies out to the line for departure. He also is charged with knowing that all supplies have been replenished, that there are the exact number of hot meals aboard the plane, that the cabin of the plane has been properly air conditioned.

From this it will be apparent that the crew chief has many chores but everyone in the service is rated on competency and the crew chief's responsibilities are largely confined to thorough checking. From this position up, posts in the maintenance sections of the airline's operations department are mostly supervisory. Next to the crew chief is the maintenance foreman—which, incidentally, is my job. At our main base in Kansas City is a chief inspector who is directly in charge of the activities of all of our inspectors in every TWA station. Next above him is William Maxfield, assistant maintenance superintendent.

The highest post in the whole maintenance section is the superintendent of maintenance. This position in TWA is filled by the veteran pilot and maintenance man, Walter A. Hamilton.

More than 300 engine and airplane technicians and mechanics are employed at the Kansas City maintenance base where Mr. Hamilton makes his headquarters. This department is recognized as one of the most complete in the world. Perhaps it might be well to outline here a little of the work accomplished at our main base and at many of the stations on TWA's coast-to-coast airway.

Each airliner is given a thorough inspection after each flight. A complete overhaul of plane, motors, propellers and other equipment is given every 575 hours at our Kansas City base. Routine inspection of the big Douglases is made at hangars in various cities on the line at from five to 25 hour periods—or anytime a plane is to remain in a hangar overnight. Cowlings and control covers are removed, spark plugs, carburetors, magnetos, oil radiators, oil and fuel pumps, starter and generator are all inspected and serviced.

Constant day-by-day records showing total flying time on every engine, airplane, propeller and accessory are kept. These serve as an unfailing check on the main-

(*Continued on page 82*)

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"The campus of the University of the Air," the great 890-acre Oakland, California, Municipal Airport, "aviation crossroads," location of the Boeing School of Aeronautics. 85% of all Boeing School graduates are employed.
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Learn Aviation at a "Crossroads of the Sky"

This modern school, owned by United Air Lines, is designed for serious-minded men who want to make a career — not a job — of aviation — who want to master every fundamental of modern aeronautics. Its base of operations is the great Oakland Municipal Airport with the highest rating that the United States Government gives. Every department of the School is Government-approved.

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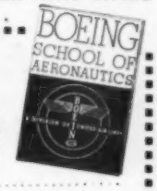

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Allies vs. Hitler

(*Continued from page* 13)

country, merely upon the story of a Charles A. Lindbergh or some other individual.

Turning to the quality of the aircraft, it can be said safely that Great Britain's latest models are superior to the Nazi equipment, and in turn the Nazis have better airplanes than the French. The same thing is true of performance; Germany's designs are certainly no better than those of either France or Great Britain and, in comparison with the English engines, hers are inferior.

The opinion of Frank Tinker, Jr., is interesting in this respect. Mr. Tinker, who fought with the Spanish Loyalist air force against the Germans and Italians and who has written many articles on his experiences in Spain, says:

"The Messerschmitt is Germany's number one fighter, but it is outclassed by old model U. S. planes. The particular one which traveled 379 m.p.h. was certainly a souped-up job. The ones we worked against in Spain had a top speed of about 275 m.p.h. at the most (at 10,000 feet). I know, because I checked three of them against the Russian development of the Boeing P-26 and, inasmuch as we were right behind them and firing steadily, it is very probable that they were traveling at top speed. They were also less maneuverable than our own planes."

It seems to me, however, that after you have reached a certain point in performance it is more important that a country has the means of producing or procuring replacements rapidly than it is to have a bomber which travels 25 m.p.h. faster than an enemy ship. Obviously it would be ridiculous to say that a country with 10,000 Aeroncas could whip another country because it had only 2,000 Boeing fighters, but when you have reached a certain standard, then greater speed of replacement is more valuable than greater performance.

Such was the experience of Mr. Tinker's own Loyalist air force, and such has been the experience of the Chinese in their fight with Japan. Those two conflicts have proved this theory to be valid, at least to my satisfaction. Despite the superiority of the Russian airplanes used by the Loyalists, their ships were knocked out of the air and their air force gradually became impotent. Why? Well, for one thing the Rebels had an almost inexhaustible supply of replacements where the Loyalists had none and, for another—according to good authority—the Loyalists made litt'e effort to destroy enemy aircraft and their bases on the ground.

The case of China is quite similar. When hostilities opened the Chinese had American aircraft which were far superior to anything possessed by the Japanese and their pilots were racially superior flyers than those of the enemy. Eventually, however, the Chinese air force almost ceased to exist because the Japanese doggedly poured more and more planes and more and more pilots into the conflict, patiently suffering losses while they whittled away at Chinese air bases, bombing the few factories available.

In this case, superiority of equipment and personnel helped China little. And, it might be said in passing, there is an interesting belief along these lines developing in our own military aviation; that is, that we have paid too much attention and spent too much money on refinements in our military airplanes. After all, the famous green carpets on the floors of the Army's Douglas bombers don't make that type a better military airplane.

Recently I was with two young Royal Air Force pilots when they saw their first United States Air Corps ships. The airplanes were not new; they were standard production models but, as the Britishers inspected them, their amazement grew and grew. Finally they climbed up and looked into the cockpit of a North American trainer used for instrument flying.

"My God," one of them cried to the other, "These people use silk hoods in their training planes!"

I believe that the results of air conflict in Spain and China is the answer to the outcome of a war between Germany, France and England. It is the air force that destroys the enemy's source of supply that is going to win the battle. England cannot prevent the Germans from raiding their little island, nor can Germany prevent British planes from bombing Nazi industrial centers. Airplanes can't stop a raid entirely, anti-aircraft guns won't do it, and the balloon barrages which are being used to protect London are only of psychological value. But, if France and England can send their bombers over and destroy German air bases and aircraft factories before Germany destroys theirs, then the Allies will be victorious.

I believe they will be. If it were France and England alone it would be a different story because I am convinced that, very early in the game, the Nazis are going to destroy very nearly all of the aircraft factories and allied industries in both countries. England, especially, is highly vulnerable to air attacks—much more so than is Germany.

Fortunately, Germany will not be taking on only England and France. She will have to fight the whole British Empire—and aircraft factories are mushrooming in far-flung outposts of that Empire. Canada is beginning wholesale production and so is Australia. The dominions will pour a stream of men and machines into the conflict against which the Germans, I hope, cannot cope. No matter how good the German air force may be, day after day it will suffer *some* losses in both machines and the means of producing them and slowly and steadily its power will diminish.

Not only that, but it may as well be taken for granted that in any such fight the United States is going to be on the side of the Allies, whether actively or not—and despite all the bellowings of the little group of ostriches in the United States Senate. We certainly are going to continue to supply the British and French

(*Concluded on page* 76)

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Wheels Over Water

(*Continued from page 34*)

breathe a sigh of relief when the turn and bank pointer swings back to the center of the dial and the compass steadies down on a north course. We are still following the skipper and he is leading us out of it.

The parallel white streaks of the rain assume a bluish tinge. The outlines of my section leader's plane become more distinct, and suddenly we burst out into the clear. A quick glance around shows that the squadron still is intact—18 planes still following the leader, with no one pulling out in a pinch—another score for air discipline. The skipper swings us around in a wide circle to the right until we head eastward along the cloud front. As I glance at the wall of rain the squadron of heavy bombers erupts from it like a string of darts from some gigantic crossbow—all intact and in proper formation. They also circle to the left and fall in behind us.

The minutes crawl by as we fly along the cloud front which stretches interminably to the east. At first I hope that we may be able to fly around it but the cloud mass becomes thicker, covering the horizon as far as the eye can see. I glance at my fuel gauge. There is gasoline for perhaps another hour, no more. After that, a water landing on wheels built for good solid ground or a hard wooden deck. Well, maybe I can set her down so she will float a while.

But one look at the angry sea below us is enough to wash that idea out of my mind. The waves are 20 or 30 feet high, with a nasty cross-chop that would make any attempt at a timid landing impossible. And to fly into a solid wall of water at 60 or 70 knots would shred into splinters any airplane ever built. Frantically my mind leaps back to the land—there *must* be land somewhere that we could reach. But even before I look at the data on my chartboard, I know the answer: "Nearest land out of range." The land nearest to us now is covered by water two miles deep.

With this realization the minutes which had been crawling now race by. One hour to go, and then . . . this must be how it would be in war time, I reflect. After the carrier had been bombed or torpedoed and you had no place to go—no place but the water. A landplane with wheels—and nothing to land on. Well, at least it would be quick!

Staring across at my wingman, I notice that his face is tense and set. My expression must be just as tense, for when he catches my eye he grins. I raise my eyebrows questioningly and he points his hand to indicate a long dive and then holds his nose like a small boy jumping off a springboard. The pantomime is so vivid that it comes like a cold shock to see my own thoughts reflected by his. Then he shakes his head and smiles as though laughing to himself. For the life of me I cannot see why. I know he has a wife and two

(*Continued on page 74*)

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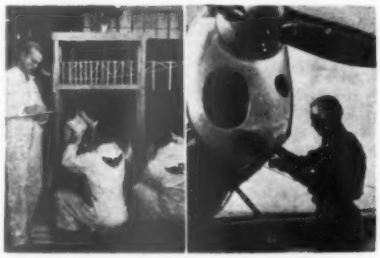

LEFT—The design of a rib by engineering students is followed by rib construction and actual static load tests. RIGHT—Practical training for the Ryan engineering student includes engine installation problems.

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Wheels Over Water

(*Continued from page* 72)

children back home; how he can find humor in the situation is beyond me.

Then the utter incongruity of the situation strikes me. Here we are sailing smoothly along in bright sunshine with comfort and safety just out of reach behind an overgrown rainsquall. We are flying the most advanced product of modern machinery, helplessly watching our engines run down like unwound clocks. Three whole squadrons about to go down at sea, under a cloudless sky. It is fantastic. Fair weather one minute, storm the next, depending on whether we fly south or east—and nothing to do but sit and take it.

My mind grasps at non-essentials—the letter I had neglected to write home from our last port and the distant cousin I was supposed to look up when we got back to San Francisco. When we got back—*that* was it; that was where the joke was!

The carrier's radio booming in my ears snaps me back to strained attention: "Fightron One; Bombron Five; Bombron Six, from *Lexington*! We have reached clear weather only a few miles south. Proceed through bad weather area until you sight us. Acknowledge"!

"Com Fightron One, Aye, aye!" responds our skipper's voice, followed immediately by acknowledgments from the other two squadron commanders. Again we head south towards the cloud front, closing up to a tight formation in order to maintain sight contact. Once more the stinging rain bites at our faces but this time we disregard it, for clear weather and safety are only a few miles ahead. Gradually the driving rain thins out. We get momentary glimpses of low, scudding clouds, then we burst into the clear.

Ahead of us lies the carrier in a natural amphitheater of bright sunshine that glistens on her wet deck. There are dark clouds behind us and on both sides, but to the southeast the sky is blue and an open pathway stretches on out to the horizon. The ship is barely making headway as she wallows through the troughs of the giant swells stirred up by the disturbance she has just passed through. One or two planes of the scouting squadron are still in the lower landing circle; the rest are aboard.

By the time we get into position over the ship it is our turn and our skipper breaks off the first section without delay. The first two pilots manage to get aboard but the third is waved off when the stern of the deck drops out from under him just as he is about to land. He has to go around again for another try. I glance apprehensively at my fuel gauge. Every minute counts now. With relief I find that I still have enough fuel for half an hour. The bombing squadrons circling above us have bigger fuel tanks with a proportionally longer flying range.

At last the first section is aboard and it is our turn to go down. My section leader signals for a right echelon and my wingman slides over to his position behind me. Not until we spiral down close to the water do I realize how much the ship is rolling and pitching. I have never seen her tossed around like this before.

Quickly I run through my check-off list: landing hook down, mixture control rich, prop in low pitch, carburetor heat off, seat up, 'chute off. I struggle out of my parachute harness, for the heavy pack would drag me down like an anchor if I should skid off of that wet deck and go over the side, even if I managed to get clear of the plane.

Watching my section leader's approach carefully, I try to time my arrival so that I will be coming aboard just as soon as he is clear of the landing area. Two thousand men aboard that ship are concentrating on each landing, trying to get us all aboard before our fuel tanks run dry. Every second is important, for one bungled approach may mean that someone goes down at sea.

The plane ahead of me is almost up to the ship. I see the stern ramp rise yards above it, then drop far below. A moment later the plane is down, but instantly there is a blast of white steam from the ship's stacks—the signal for a deck crash. I pull up and out to one side. As I fly past I can see the deck crew rushing for the stricken airplane. It lies motionless at a grotesque angle with the deck. Luckily there is no fire.

Circling again for another approach, I am again warned away. As I pass above the deck I can see the crash crew walking the smashed plane up the deck, like ants around the body of a dead wasp. A weak feeling seizes the pit of my stomach. I wonder about the fate of the pilot. Was he . . .? But there is

(*Concluded on page* 80)

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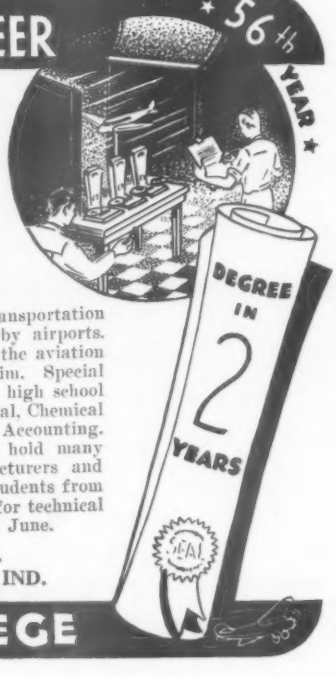

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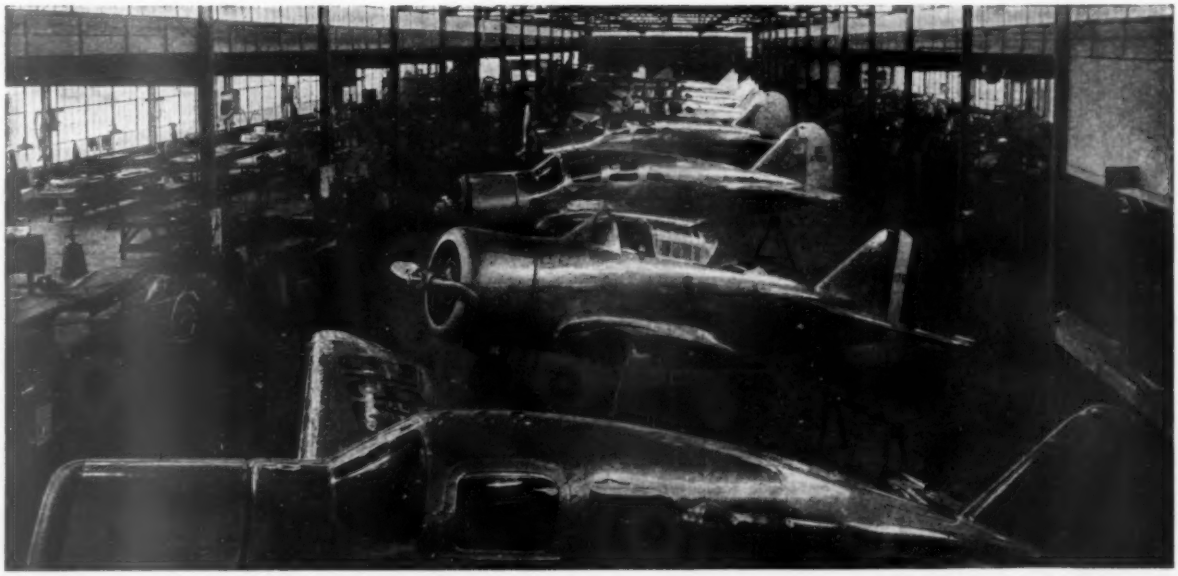

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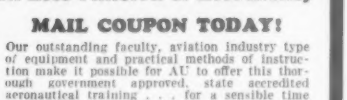

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PATENT YOUR IDEA

Allies vs. Hitler

(*Continued from page* 70)

with equipment, and just our existing factories alone can beat Germany at her own game, both in production and quality.

The factories now operating in the United States can turn out 75 airplanes a day—by farming out orders for parts to other already qualified industries—that are qualitatively superior to *anything* Germany now is producing. Under wartime requirements, it seems obvious that this great industrial country can equal or outpace the production of all three nations combined. No nation as economically unsound and materially poor as Germany can compete with that.

If I have purposely ignored Russia in these calculations, it is because that country is an unknown quantity. The Russians are given to grandiose statements but they actually say very little of a definite nature and they haven't yet shown the world anything that would bear out their assertions of the death and destruction that would face an enemy.

For instance, Colonel I. Okunev, acting military attaché of the Embassy of the Union of Soviet Socialist Republics in Washington, replied to a request from the editor of this magazine for information in the following fashion:

"In reply to your inquiry I quote from a letter signed by 11 of the outstanding flyers of the U. S. S. R. and printed in the *Pravda* (newspaper published in Moscow), October 9, 1938:

'Soviet aviation holds the majority of the international air records today. . . . This is the reason for the brilliant Soviet air achievements. And the latest flight of Kokkinaki and that of the heroic women flyers—Grizodubova, Osipenko and Raskova—also are striking evidence of the condition of Soviet aviation.

' . . . The Week agency (London News Service) reports that, according to information in the possession of the higher command in London, Paris and Prague (this letter was written before Hitler's grab of Czecho-Slovakia—Ed.) the Soviet air force is at least as strong as the German and Japanese air forces taken together, not to speak of the qualitative superiority of Soviet aviation.' "

The Russian equipment displayed in Spain—which Mr. Tinker described—wasn't modern by American standards even if it was superior to the German equipment. Of course, it is perfectly fair to admit that possibly the Russians didn't waste their best equipment in Spain, but the ships in which Mr. Tinker flew are improved versions of airplanes which have been obsolete in this country for from seven to nearly 10 years.

"Russia undoubtedly has the strongest air force in the world," Tinker said. "When I was in contact with the Russians in Spain (about two years ago) the Russian air force had about 20,000 planes of all kinds in service. What her air strength is today I wouldn't even try to guess. At that time her oldest type of fighting plane was the development of our Boeing P-12—and it was far better then than the new Fiats and Heinkels . . . ."

If this is true it is encouraging, but the unfortunate part of it is that Russia's attitude toward a war between Germany and the Allies still is very much of a question. What she would do is definitely an unknown factor in international calculations and how effective her air force actually would be is equally a mystery. Such also is the case with the Italians who, although they appear to have first class equipment, never have been conspicuous for their bravery in a battle.

Summing it up briefly, I should say that the fate of France and England depends mainly on production, both at home and abroad. The longer the war is held off, the better their position at home will be—and the worse that of Germany—for it seems obvious that the Nazis are close to maximum output, while the Allies are gaining strength daily.

Both countries must keep a ceaseless vigil against a surprise assault, for the defense of their means of production is all-important and undoubtedly Hitler will open hostilities without warning—and undoubtedly the first objective of his bombers will be the industries of both nations, especially the aircraft industry.

While I believe that the Allies will have help from the United States, it is equally certain that they will have to hold out by themselves for some time, and the period between the opening of hostilities and the arrival of aid from this side of the Atlantic will be a crucial one. For a while, England and France will stand alone. It is on their ability to do this successfully that the fate of England—not the fate of the British Empire—rests.

Time alone will give the answer. Those of us on this side of the ocean who believe that the future of civilization lies in the hands of England, France and the United States can only hope that the answer will be that democracy delivers—through the airplane—a death blow to organized savagery and national ruthlessness.

END

I'm One of the 20,000

(*Continued from page* 15)

in the other schools. At the time of this writing, Purdue was way out in front with more than 40 per cent of its flying hours completed. Alabama University was next with 25 per cent, and we at the University of Michigan were third with 22 per cent of our scheduled 800 hours finished. This doesn't mean very much, though, because administrative difficulties and weather probably have held up some of the other schools.

That's about all there is to tell about the program at this end. I suppose the officials down in Washington are busy preparing for 20,000 student pilots next year and that will make bigger news.

Meantime, I don't mind being a Government guinea pig. A private pilot's license for $60 isn't to be sneezed at—at any university.

END

A SCHOOL THAT OFFERS A *Complete* OPPORTUNITY TO BEST BUILD YOUR AVIATION CAREER . . . .

The selection of a school for a specialized education in aeronautics is a very serious matter. The Catholic Archdiocese of Chicago has spared no time and effort in shaping a course of study which would give the student a combination of all the work necessary to make him a competent engineer, a master pilot, and a man whose experience would permit him to enter any phase of the aeronautical industry with the assuranace that he be truly valuable to his employer, and that his promotion be sure and rapid. We feel that to fit a man more thoroughly for such work, more time should be devoted to the course of study and a great deal of actual shop and production practice should be included, as well as a thorough knowledge of the problems encountered in general business and salesmanship. In order to do this, the course runs 180 weeks, which is some 36 weeks longer than an engineering course in any of the leading universities offering a Bachelor of Science degree. The course extends through the summer months and is extremely intensive. It requires a tremendous amount of hard work but the results offer the utmost in training with the assurance that the ultimate in an education of the type desired has been earned.

The surroundings and social functions which accompany and make up part of such an education and which are necessary to complete development are exactly as you would have it. All social activities are supervised, and all home surroundings —since all students live on the campus— are of the type of which your parents will no doubt highly approve. You are allowed to develop yourself with the advice, supervision, and kind guidance of the clergy, brothers, and faculty who make up a very close part and serve as mentors and parents while you are a resident at the school.

Since our tuition costs include all essentials, it is not necessary for the student to consider all the incidental expenses which generally accompany "going to college," as those are all taken care of in this charge.

Flight training is only offered to students enrolled in the engineering course and includes 300 hours in all types of aircraft and under all conditions. It is the most complete course possible and produces a master pilot. This course entails an additional charge and is taken with the engineering work throughout the four years.

Although flight training is not essential to the man wishing to train himself primarily in engineering, it is a decided asset and is offered to those wishing to further enhance their usefulness in the field of aeronautics. Due to the intensive nature of the course, it is impossible for a student to work part-time while attending the college, and we therefore must discourage those wishing to secure an education by this method.

The intensive nature of the work requires that the entrants to our school have secured the proper high school foundation as we require that each student be from the top quarter of his graduating class in his former schooling. College classes start the first week in September and continue on until completion.

NON-SECTARIAN

Our school is under the personal direction of His Excellency, Bishop Bernard J. Sheil, Auxiliary Bishop of Chicago, and founder of the nation-wide Catholic Youth Organization. It is entirely non-profit and is one of his many enterprises to provide a lasting, worthwhile foundation for the Youth of America. The course is open to any and all boys, regardless of Faith, who are ambitious to accomplish a lasting success through hard work and endeavor. We cordially invite you to investigate our facilities.

A tremendous amount of practical experience is gained in the well-equipped machine, forge, motor, and wood-working shops. A competent engineer cannot be produced without a full amount of this type of work under experienced instructors. The machine shop pictured is fully equipped with lathes, shapers, millers, grinders, drill presses, etc.

All students, if they desire, are given twenty hours of flight training with the Engineering Course. All students must be enrolled in the Engineering Course to take flight training. A complete 300-hour course is given if desired and taken over the same period as the engineering. Ships of modern manufacture, ranging from 50 to 330 horse power are used in both open and closed types.

LOCATION

The school is located 35 miles from Chicago's loop, 6 miles north of Joliet, and accessible by quick bus transportation to and from Chicago with railroad connections from Lockport and Joliet. Visitors are welcome to inspect this school at any time.

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High Flight

(*Continued from page* 18)

York and later at Washington, where CAA representatives were given a practical test of the apparatus, the "flying laboratory" was pronounced practical and safe.

As stated briefly above, the mask weighs only four ounces. Oxygen is breathed through the nose. The gas is fed to the nostrils by two rubber tubes built to pass around the mouth so that the wearer may talk or eat in comfort and without vocal distortion in speech. Below the breathing tubes is a bulb-like container, resembling a football bladder. Into this container, the wearer of the mask breathes carbon dioxide.

Oxygen is fed through a rubber tube about one-quarter of an inch in diameter, from an outlet at each seat. When one breathes the oygen into his lungs, a quantity of the carbon dioxide from the bag is mixed with it. This mixture induces the breather to inhale more deeply at higher levels. The remainder of the carbon dioxide is expelled through an outlet at the bottom of the bulb. Between the mask proper and the bulb is a small valve which the wearer may regulate for his comfort in admitting more or less oxygen.

The outlets at each passenger's and pilot's seat are fed by pipelines of the special alloy. This alloy is strong enough to handle the pressure, yet light enough so that the total weight of the entire apparatus for each plane is only 40 pounds. From the outlets the pipes run back, on both sides of the fuselage, to the lavatory. Here, in special compartments, are housed the oxygen storage tanks and regulator panel.

The oxygen is contained in tanks, resembling small green bottles, under a pressure of 1,500-1,800 pounds. From the bottles the gas is carried upward into valves of the regulator panel. The panel was designed by Larson and other Northwest engineers. Two valves step the pressure down from 1,500-1,800 pounds in the storage tank to two pounds on the line, which is the pressure of the flow of oxygen in liters per minute.

Simplicity of design and operation are attributes of the apparatus. The pilot, before a high altitude flight, simply sets one small valve to determine the flow of oxygen according to the flight level he plans to attain. While he may change this flow en route, it is not necessary to change it unless a higher altitude is desired. The flow, once determined, is constant. For flying at a top level of 20,000 feet a bottle of oxygen under 1,800 pounds pressure will handle the normal requirements of 10 passengers and two pilots for a five-hour flight.

It is known that Northwest Airlines engineers now are at work on an adaptation of the inhalating apparatus whereby the flow of oxygen will be set automatically, according to the flight levels. One fact is interesting. Not all people find it necessary to use the oxygen apparatus at levels of even 20 000 feet. We recall that on one experimental flight on which we were a passenger one of the pilots failed to don his mask until the 20,000 foot level, simply because he was too interested in other duties. It is known that some persons' physiques are such that they can stand the rarified atmosphere of higher flight levels with little or no physical discomfort. The oxygen masks are designed solely for relieving the physical and mental fatigue of pilots and passengers.

When do you need it? You don't know. It may come at 10,000 or 20,000 feet. The reason people use oxygen on such flights is that, at high altitudes, your heart and lungs work harder because the air is thinner and lacks oxygen. The mask supplies sufficient oxygen to make breathing normal and unlabored.

What about the descent from these high levels? Dr. Boothby and Dr. Lovelace have been using a mixture of 20 per cent oxygen and 80 per cent helium for making descents easier—especially on the ears of the passengers. Passengers aboard the flight to Boston and those on test hops with the ship at New York and Washington were given this mixture. Press accounts said the "human guinea pigs" had no discomfort such as "ear-plugging". Helium penetrates the tubes from the throat to the inner ear, thus relieving undue pressure built up on the outside of the car.

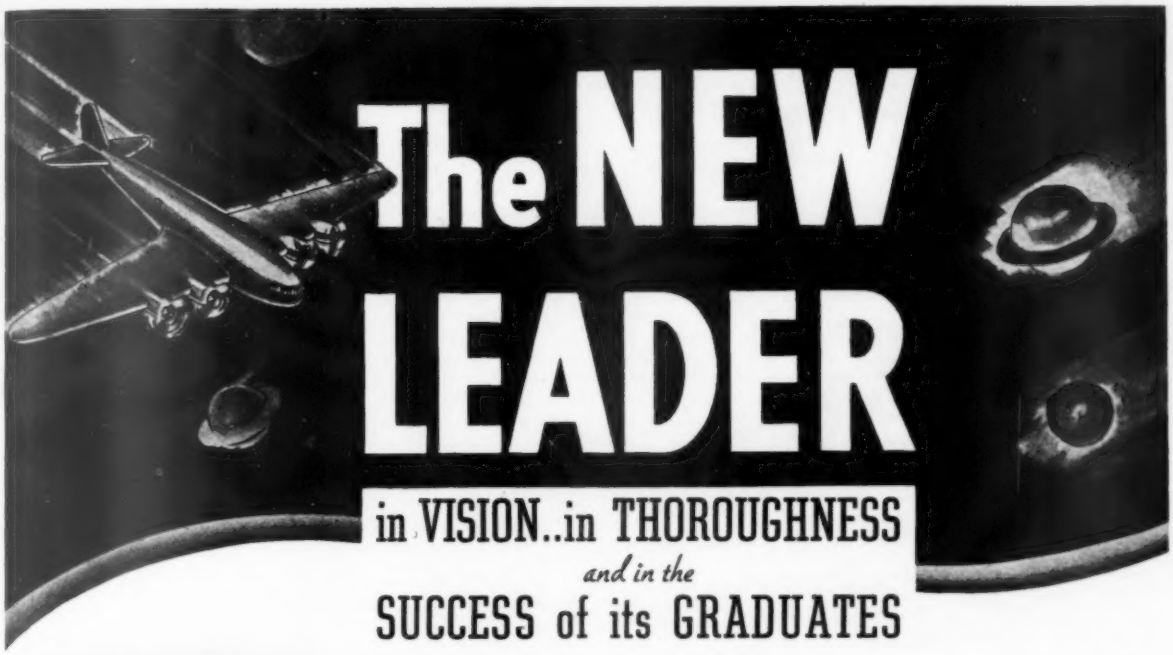
Well, you might ask, why do airlines fly at such high levels anyway? For one thing, engines perform much more efficiently at higher levels when suitably supercharged. Also the air is thin and there's less resistance to flight. Although the full power of the engines sometimes cannot be used because of the absence of adequate oxygen, speeds are greater for the power which can be used. Thus the average speed on the Minneapolis-Boston flight was 241 m.p.h., with the engines doing about 30 per cent of their maximum work.

America likes to travel in a hurry. Those non-stop, cross-country schedules which airlines talk about aren't too far away. Flying in the substratosphere has been done. Flying in the stratosphere itself is just around the corner. While sealed, supercharged cabins probably will be the answer to the problem of supplying oxygen for extreme high levels, the oxygen masks—for the present—offer one solution to the problem for moderately high levels. This equipment is fairly inexpensive, has been proved safe, and is practical.

The only "fly in the ointment", therefore, seems to be—as Mrs. Freeburg suggested:

"They've got to make them more attractive if they expect the masks to make a hit with the fastidious woman traveler." And, inasmuch as airlines constantly are attempting to make air travel more attractive to women, we wouldn't be surprised to find the modern motif for oxygen masks including pastel shades of rubber for the masks and tubing and perhaps even a delicate scent added to the oxygen, just to make this novel equipment more in keeping with women's styles.

END



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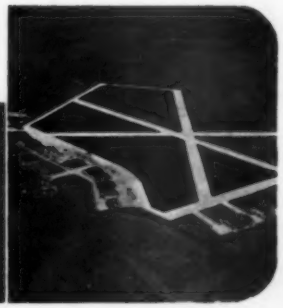

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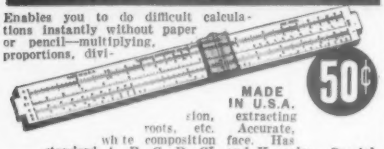

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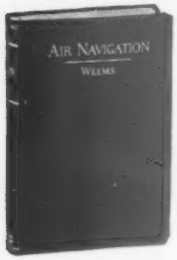

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Wheels Over Water

(*Continued from page 74*)

no time for idle speculation, for *my turn is next!*

This time the deck is clear and I concentrate on the approach. At first I am high, but I overcorrect and approach too low—a sure form of suicide. A little more throttle and I am back up in proper position. Now I am over the stern which is luckily level for a moment. Chopping the throttle off, I hold my breath and ease the stick back. There is a jolt as the wheels strike the deck, a jerk as the landing hook engages the arresting gear. I am safely aboard.

At last I can relax. I exhale slowly. Then the reaction sets in. My knees begin to shake so that I can hardly keep my feet on the brake pedals while the mechanics put chocks under the wheels. Finally I climb weakly out of the cockpit, then get a real thrill when I see my section leader, safe and sound, busily inspecting his plane's wrecked undercarriage.

The snarl of a propeller overhead draws all eyes upward. Someone else has had to go around again. "Come on!" cries my wingman, climbing down from his plane. "Let's go back and watch the others come aboard!"

Together we hurry back along the slippery deck and climb up on top of the after gun turret, which gives us a grandstand view of the performance. We are no sooner there than we see another crackup. The ship rolls heavily as one of the large bombers is taxying up the wet deck, and the big plane slides sidewise. It smashes into the turret on which we are standing, badly damaging the plane. The pilot climbs out unscratched.

Half a dozen other planes manage to get aboard safely, then the ship strikes a huge swell that make her stern pitch high in the air just as one of the bombers levels off for a landing. The pilot noses over in a frantic attempt to get down, and the plane's wheels strike the deck with terrific force. With a tremendous bounce, the big plane sails past our turret like some monstrous insect, then squashes down into the mass of parked planes beyond. There is a confused jumble of men and airplanes, sirens and whistles, but the after part of the deck is clear and the remaining planes continue to come aboard with machine-like precision.

Not long afterward it is all over. We can hardly believe that every plane has been brought back aboard the carrier under almost impossible conditions. Five planes are badly damaged, two of them wrecked beyond repair, *but not a single man has been injured.*

That night as we relax in the comfort and security of the wardroom after a hearty meal, the operations plan for the next day is announced. The maneuvers will continue where we left off that day. First call will be at 3:45 in the morning—for the squadrons will take off at dawn.

END

Airplanes Don't Make . . .

(*Continued from page 38*)

ing up with developments or exploring the possibilities of developments on all phases of military aviation and taking advantage of every possibility can our present air leaders bring our Air Force to the peak which is expected by our political leaders who are voting the authority and funds for a larger air defense organization. It will be just as hard a fight to keep the Air Force at that high peak of perfection in all its phases. The key word is "research"—in tactics, personnel training, and engineering. Engineering research is behind all the activities which visitors to Wright Field, the Air Corps Materiel Division, have noticed going on. Bids have just been requested from the manufacturers for airplanes of all military types. Newspaper items mention boards being formed of officers experienced in various phases of military aviation, to evaluate the manufacturers' entries in the type competitions. To further encourage the manufacturers, authority has been given to partially reimburse the "best losers" in such competitions for their honest though unsuccessful efforts. It is safe to say that because of engineering research the last manufactured batch of planes of any one type will differ somewhat from the first batch. Newer and better ideas and gadgets being incorporated in them from time to time as they are discovered, invented or proven feasible.

Organization is another factor in the building of an air force; organization of individuals and individual airplanes into squadrons, the squadrons into groups and the groups into wings. Not all squadrons are combat squadrons such as attack, pursuit, bombardment or reconnaissance. There must be base squadrons to take care of housekeeping and overhead at the bases; weather squadrons, manned by meteorologists; and transport squadrons, to mention a few of the miscellaneous types. These are all Air Corps units, manned by Air Corps officers and enlisted men. In addition there must be provision in the expanded Air Force for Signal Corps units to handle communications between headquarters, medical units to take care of the health of the flyers, ordinance units to handle, literally, the bombs and ammunition, and organizations of other specialist troops trained to their specialty and particularly competent to assist the Air Force in its varied responsibilities.

When the Air Force expansion officially gets under way on July 1st it will do so under the impetus of this high pressure preliminary planning. But planning is a continuous job and much honest and manly sweat is yet to be expended before the Air Force reaches its peak. All ranks and grades in the Air Corps will bear the burden—from General Arnold, Chief of the Air Corps, and Major General Delos C. Emmons, newly appointed GHQ Air Force commander,

(*Continued on page 83*)

Flying Circus

(*Continued from page 64*)

town in the Pennsylvania anthracite regions, flying from a level spot on a mountain ridge about 300 feet wide and 1,200 feet long. Shamokin was booming. The hard coal miners were flush with money. Eager to fly, they thronged to the flying field. Each man holding up his $15 fare high above the crowd, they fought to the side of Hoppin's plane, shouting:

"My turn next."

Hoppin took up a few of the $15 passengers, returning each time to find the landing area of his improvised field thronged with the eager would-be passengers, fighting to be next in line to pay $15 for a brief few minutes of flight.

Now this was a new experience. The ordinary American yokels always had been hard to sell—dour, stubborn, timid, embarking on their first rides with epic solemnity. But here were passengers crowding in to fly; crowding in so that they didn't leave open even a safe landing area.

"It's no use," said Hoppin. "We can't afford to take a chance of killing anyone."

So he quit flying for a time, giving thought to the problem, while the disappointed would-be passengers transferred their disaffections to Hoppin and his idle airplane.

Suddenly he was struck by a great idea.

"Here you," he ordered his mechanic. "Dash down and buy some rope, all the rope you can find."

Hoppin and his mechanic encircled the landing area with the rope and then issued an ultimatum:

"Anyone caught inside the ropes won't be permitted to buy a ride. If too many crowd inside anyway, we quit flying and go elsewhere."

Then Hoppin resumed the business of selling nice long five-minute airplane rides at $15 each, as fast as he could unload one passenger and crowd in another. The crowd respectfully stayed outside the ropes. In two days, he cleared $2,200—which is a lot of money for a two-place airplane.

Basil Rowe, too, had his moments in barnstorming the country before he laid the ground work in Central America that became the nucleus of the world's greatest airline—Pan American Airways.

Serving as an enlisted mechanic in the air service during the World War, Rowe had sneaked in a few rides and observed closely. At the close of the war, he bought a condemned Jenny and embarked, without further fuss or training, upon his flying career.

Rowe teamed up with a wingwalker, who proposed to swing beneath Rowe's plane from one wing tip to the other wing tip, by means of a rope attached to the plane's axle. They tried it at a Pennsylvania fair. But it didn't work—and the wingwalker found himself dangling from the rope far below the plane. He tried a pendulum swing. Rowe tried steep banks, but no use.

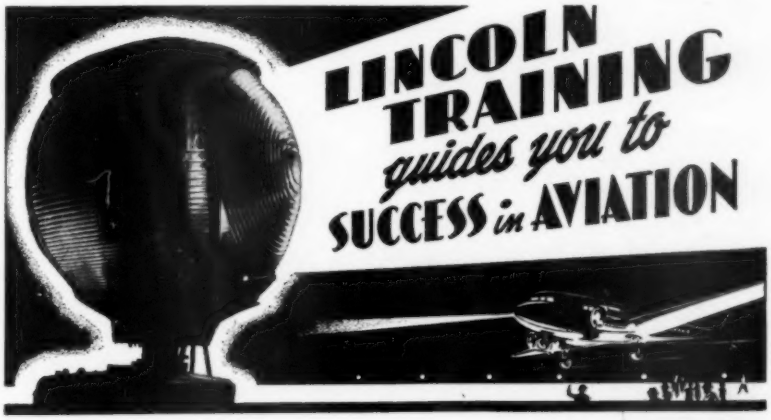
The wingwalker finally climbed hand over hand to the axle, where he sat like a monkey in a tree, pale and shaking, while Rowe brought in his plane for one of the most cautious landings of his flying career.

When the hop price dropped to $5, Rowe moved to Porto Rico, and here he found the barnstorming business booming anew. Aviation was a miracle to the West Indian natives. Half clad peasants, to whom $5 was a fortune, crowded around Rowe's plane wherever he landed—and paid the $5 cheerfully for a hop.

Teaming up with the manager of a plantation for a great American sugar corporation, Rowe established the West Indies Aerial Express Company, a concern which served Porto Rico, Haiti, Santo Domingo and the Virgin Islands. This concern later was bought out by Pan American Airways and Rowe continued as chief pilot.

Another of the Gates circus graduates—Roy Ahearn—died in a spectacular accident at Teterboro, N. J., in 1930. Ahearn, flying a fast pursuit ship, sought to accomplish an outside loop. Six times he tried unsuccessfully. Then, on his seventh try, a wing suddenly crumpled, pinning Ahearn in the cockpit.

END



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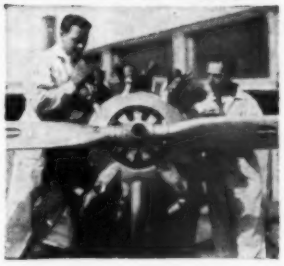

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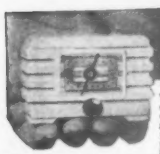

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Airline Mechanic

(*Continued from page* 68)

tenance work done or needed to be performed.

When a plane is taken to the hangar, let us say, at the Chicago Municipal Airport between flights, a whole crew of mechanics take over. Charts itemizing every part of the engine and plane are posted on a board. As a mechanic inspects a part he okays that particular part by initialing his number opposite it on the chart. Nothing is left to chance or guess. Each worker is mindful of his responsibility in doing the job.

The engines and all individual parts connected with them are checked. All instruments in the cockpit are given visual inspection. All wing and cabin wires are checked. The same careful scrutiny is given to other things such as cabin lights and buzzers, lavatory and radio lights, instrument lights and fuses and the navigation, landing and warning lights. Care is taken that the pilots' cabin is in perfect order. This includes inspection of the windows, seats and landing gear signals.

I have already told of the care given to the interior of the cabins. The exterior of the plane is also given a thorough going over. Every function of the landing gear is checked. The brakes and brake-controls are tested. Besides examining the wheels, the crew makes certain there is proper inflation of the huge tires. The rudder, wing flaps, wing flap fittings, tail wires and turnbuckles, tail wheel assembly—all must be given an individual okay. At 50 hours each plane undergoes this complete going over. And, in addition, the spark plugs are changed and the speed ring is removed to check the exhaust collector ring.

Then when a plane has been flown 100 hours, every single item on the inspection sheets must be tested and checked. Oil is drained and replaced with new oil. Sparkplugs again are removed and replaced with new ones. The big transports are jacked up and the action of the landing gear retraction mechanism is given a thorough examination.

Present day motors do not wear out. All unsatisfactory parts are so continually replaced that the motor is practically rebuilt at the end of 575 hours of flight time. At the end of that period each TWA plane is flown to the "roundhouse of the air" as the Kansas City base is sometimes called. There each engine is removed from the plane and completely overhauled by an army of workers.

At least every 3,500 hours it is required that wings, rudder, elevators and ailerons be removed and all plane structures inspected. At this time the landing gear is removed and replaced by one which has been overhauled and stress-tested.

The reliability of modern American aircraft engines and planes, regularly inspected and overhauled, is acknowledged everywhere. It is also acknowledged that this would not be true were it not for the excellent work done by the maintenance men. It is their job well done that makes it possible for the pilots to fly the planes from coast to coast overnight on regular schedules. While we in the maintenance departments are seldom watched in awe as we "tear-down" an engine or service a plane, the maintenance foreman, crew chiefs, mechanics, apprentice mechanics and cleaners know and feel that we are playing an important role in aviation.

That is probably why there is so much "snap" to the salutes of our men as they stand on the line and watch the station manager give the okay to the Captain who taxies the huge transport over to the runway, gives it the gun and takes off with its cargo of passengers, mail and express.

END

Bug Fighters

(*Continued from page* 50)

align the ship with the next swath. At the peak of the turn the throttle again is eased back and a new approach is made into the cotton, this time some 50 or 60 feet over from the last application. On entering the field again, the hopper door is opened and a repetition of the former trip is made.

If there are no obstructions at the end of the field, the turn at the swath's end may be made at a low altitude, but, as the most productive soil is usually adjacent to a wooded area, the end turns are nearly always something to be reckoned with in order to blow poison into the end regions and fence corners and still gain sufficient altitude to clear the obstructions without incident. This particular phase of dusting is the one with which pilots are most concerned, because a motor failure at this point, with a load of poison, is extremely dangerous.

During a morning or evening session, a pilot may have two or three jobs near each other. Also, there always is the possibility of rain washing the dust off before it has become effective, necessitating another application. To be really effective the poison should be on the cotton for at least 36 hours.

The airplane application of dust has proven to be a very effective measure, much better than the old ground machine application and is being accepted by more planters each year. However, there are a few die-hards who still cling to the belief it can't be done. Nevertheless, Department of Agriculture statistics prove that cotton protected in this manner gets a more complete and effective coverage causing a more satisfactory kill, in most cases 100 per cent. This all tends to benefit the planter as well as producing a much better grade of cotton, thus aiding the industry by helping to maintain a general higher price per pound for the cotton.

The lads who do the dusting feel a personal interest in their work. The hours and nature of their profession are not the most pleasant, but there is little dissension among the pilots. Planters are becoming more and more pleased each year. So, considering everything, you won't find a better-natured, bigger-hearted bunch of pilots anywhere.

END

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Airy Chat

(*Continued from page 8*)

Some of their stories would make Mr. Winston sound like a rank conservative.

* * *

THE airlines are in for a peck of trouble unless they do something about their pilots—and do it soon. In the first place, there's pretty serious pilot shortage at present and threats of an even worse situation within a few months. Main reason is that the Army and Navy are making it attractive for their flying officers to continue in those services. A military pilot has a fairly comfortable future to look forward to—despite the fact that his salary is somewhat lower than that of the airline pilot. By and large, the chief worry of the airline pilot today is provision for his future. He's spent many years and thousands of dollars getting where he is today. Yet, a medical examiner or government inspector can put a definite end to that pilot's career—and earning power—in one hour flat. The Army and Navy have retirement plans, the airlines have nothing.

After a certain number of years' service a military pilot would be retired and supplied with enough money to live comfortably the rest of his life. The airline pilot has none of this to look forward to; that's why the Army and Navy are taking so many airline pilots away from the lines. One thing the disgruntled airline pilot doesn't realize, however, is the fact that, under an obscure postal regulation (a hangover from the days the Post Office Department itself flew the mail) the airline pilot's salary today figuratively *includes* a 30 per cent increase required by the government in its air mail contracts with the private contractors. In other words, the average airline pilot today is getting 30 per cent more than he might logically be entitled to—because the Post Office Department made that provision for *its* pilot's future many years ago. Not one present-day airline pilot in 100 realizes this, however, and the airlines must act decisively to protect their pilots' future, regardless of circumstances—or the airlines will be hiring pilots at a premium before long.

* * *

Can't say we didn't warn 'em.

M. K.

END

Airplanes Don't Make . . .

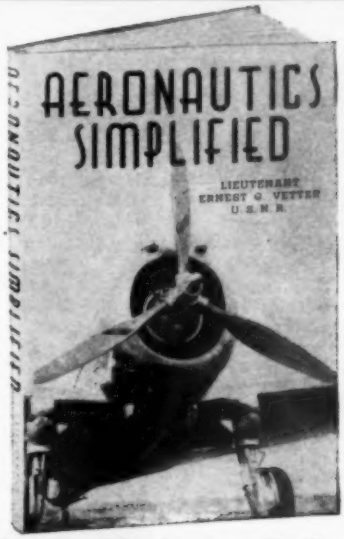
(*Continued from page 80*)

to Private Joe Doakes, poring over a new maintenance manual and then pawing over a new twin-row radial engine.

It will not be long before these new airplanes, several thousands of them, receive their final inspection check and are shoved out on the factories' flying lines ready for fly-away by Air Corps pilots. New, shiny and efficient they will be, but *they alone* do not make an air force.

Brains and sweat also are important. Too bad that *they* too can't be photographed for display.

END



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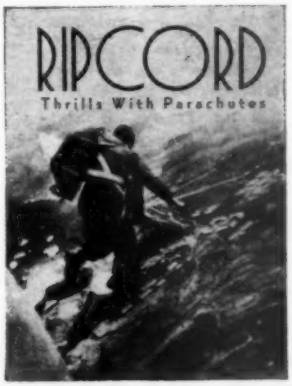

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Night Mission

(*Continued from page 30*)

point" is sighted ahead. My data sheet is nearly complete. The third element leader is giving the attention signal and I am looking with strained eyes for the planes he has sighted—wondering if they have sightd our formation and are getting ready for an attack. Can they out-run us now? Should they attack, I will make them go to the tree tops for us. The "initial" point is checked and we are skimming along at attack altitude. My eyes are measuring the space between the belly of my airplane and the trees. Highways are taking the form of white strings as I cross them at an angle. Farm houses are transformed to play blocks as my speed increases. Automobiles are passed with a flick. Speed, low altitude and more speed. The hand of the clock is steadily moving toward that appointed time. The "objective" is in sight. I give the signal for attack. Nine throttles are opened in unison as we fan the tree tops with blistering speed. Nine night eagles have sensed the kill and are leaping into action. The minute hand slides across the 9:15 p.m. marker as the target darts under the formation.

Objective reached on time. Altitude 100 feet.

Steadily we are climbing to 3,000 feet and our compass course is leading us home. Langley Field weather broadcast breaks through: "Ceiling 2,500 feet. Wind East 4. Barometer 52. Temperature 56. That is all. Langley Field by. Special to all Army airplanes: fog covering east end of peninsula, zero ceiling predicted for 10:45. That is all".

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"Attack planes land immediately. Southeast end of field covered with fog. Rolling in rapidly. Land with caution. Lanagley by". "O.K.! Let 'er roll."

My report reads: "Low altitude night attack mission successful. Objective reached on time. Mission complete."

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Men of the Soil

(*Continued from page 54*)

surf stood out in colorful contrast like a huge chocolate malt poured in a sea of ink. Here was a heart-breaking scene as tons of fertile California soil slowly settled out of sight, forever lost to the farmer. Here too was a powerful story-telling picture which could be made only from our vantage point in the airplane.

On another occasion where the airplane made possible the taking of a worthwhile picture, an SCS photographer conceived the idea of making a motion picture which would show how huge gullies that sometimes extend for miles and destroy thousands of dollars worth of farm land, really start as tiny rills. For this shot a Waco "F" was used with the photographer and the camera equipment in the rear cockpit. The pilot flew to the head of a watershed where hundreds of small rills scarred an entire hillside field. Circling and flying down the slope the photographer trained his camera on the head of the gully where the rills came together and the pilot flew down the slope keeping the plane at the same distance above the ground. The result on the screen was a progressive picture of a $20,000 land cancer from its start as a series of fingering rills two inches in depth to a canyon 100 feet wide and seventy-five feet deep. This picture, evidence of man's careless use of the land and the story of the progress of a gully was told in the most convincing manner possible, thanks again to the airplane.

In the California-Nevada region the contract to cover this type of flying was awarded to Bill Hackbarth of the Santa Paula Flying Service. The Stinson *Reliant* most frequently used for viewing trips and photography was altered somewhat to make it more convenient. The left door in the cabin now contains a large removable panel which, when taken out, provides the photographer with a clear view between struts for making obliques. Wearing a safety belt attached to a ring bolt inside the cabin and seated on a parachute the photographer can lean out as far as necessary and make nearly vertical photos although for this purpose a 9x12-inch well has been cut through the floor of the ship.

This plane has carried SCS officials 30,000 miles on trips within the region. It has been estimated that three men and the pilot can cover territory in eight hours that would require two weeks by automobile and many areas have been surveyed and photographed that are completely inaccessible by car or pack train.

On a few of these trips when the plane landed at projects farmers who were inclined to doubt the existence of an erosion problem, were given an inspection trip over their properties. For the first time, these farmers had the opportunity of comparing their farms with those of their neighbors. One stated, "Gee, I thought I had a pretty good looking place but I see a lot of bare spots I am going to have to fix." Farmers who were able to see from the air the large percentage of depleted acres and in some cases even abandoned farms surrounding their own properties made the statement, "Anything you want to do on my property to control erosion is okay." These same men admitted that they had never bothered to walk or drive around and examine neighboring fields where soil losses had been heavy.

In summing up these activities it can be seen that the Federal government has done a lot for aviation in general, keeping many planes and pilots in the air. Because of the tremendous contracts awarded it has been possible to develop many new and better aerial cameras and laboratory practices, but these advantages to aviation and aerial photography are small when compared to the value of the airplane to the Soil Conservation Service in the advancement of its aim—to teach *you* to *want* to conserve *your* resources for coming generations.

END

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I Learned About . . .

(*Continued from page* 19)

bearing. What I didn't stop to realize was that, while it looked very permanent from where I sat, there wasn't any anchor on it. And it was drifting. So was I. By the time I realized this I was far off my course, and corrected about 30 degrees. I corrected because I was practically among the trees on a mountain. Of course, I over-corrected and swung far off my course once more.

I got a hole, went down and found out where I was. Then I went up again. I'd figured on a short flight and the wind was making it a long one. The wind certainly lengthens out a flight in a 90-100 m.p.h. ship. I hung on doggedly, wishing that I'd never taken up flying for a living in the first place.

After a long time I figured that I must be somewhere near the San Francisco Bay region—if not right over Market street. I went down through the soup and found out that generally I was right. I was in California, all right. I had about 500 feet altitude and I was flirting with the Oakland side of the San Mateo bridge. I got my bearings right away only because I was so familiar with the country.

From that point in was easy.

A short time later I had to return to Los Angeles. I threw theory into the wastebasket. I asked a lot of questions and found out that it would take me ten minutes longer to go via Lebec and Sandberg, which is a sort of pass, than it would to go the way I had come—practically smack into Frazier Mountain and over the Matau flats, which is very, very tough country.

I asked more questions and found other little detours I could make, thus adding a few minutes to my flying time, but giving me peace of mind. I also added another little innovation to my flight. I took the trouble to check the weather along the route and at my destination.

These two things: 1) checking the route over which I was going to fly, and 2) checking the weather at destination became two inviolable rules to me from that time on. I never have made a flight since without knowing exactly what I was going to encounter.

Of course, that one flight didn't cure me of everything. For some time later I'd do odd things such as flying at night with only a flashlight. I had one field into which I flew quite a bit after the shades of night had fallen. It had high tension wires. I flew around with my flashlight until I found the wires, then used them to guide me into the field.

But I stopped doing these things after a while, just as I stopped relying on what I didn't know, what I thought I knew and began asking questions.

Young pilots are often afraid to ask. They think they are showing themselves up. I have known a lot of guys like that. They were fine fellows.

May they rest in peace.

END

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The Story of Vickers

(*Continued from page 47*)

fitted with only two Rolls-Royce *Kestrel* engines. It was later fitted with two Bristol *Pegasus* engines. This year was notable for the performance of the special *Vespa* which regained for England the world's height record already mentioned.

In 1933 a development of the *Vellore* appeared. This machine, known as the *Vellox*, was fitted with two Bristol *Pegasus* engines and was designed to be readily adaptable to almost any military or civil purpose. It appeared during the year in both landplane and seaplane form, but the type was not perpetrated.

In 1934 the Vickers company produced the Type G4/31 general purpose biplane which was designed to an official Air Ministry specification. At the same time it designed and built another machine as a private venture which was capable of carrying a considerably greater load than was called for in the official specification. This latter machine was the first to be built on the now-famous Vickers-Wallis geodetic principle, which combines in a marked degree great stiffness and strength with a structure weight so low as to give range and load-carrying figures hitherto considered unattainable. After convincing tests this machine was adopted by the Air Ministry and named the *Wellesley*. Its success as a load-carrier was amply demonstrated last year with the remarkable formation flight by three *Wellesleys* from Egypt to Australia, during the course of which all three machines beat the world's distance record by hundreds of miles. The greatest distance flown non-stop was 7,162 miles.

In 1936 the second geodetic type made its appearance. This was a twin-engined bomber built to the Air Ministry B9/32 specification. This machine proved itself under test to possess similarly convincing load-carrying capabilities and it was very soon put into production under the name *Wellington*. Another interesting 1936 production was the *Venom* light single-seat fighter monoplane. This was the first military type to be fitted with a Bristol sleeve-valve engine.

At the time of writing the following types of Vickers airplanes were in service in the Royal Air Force: *Wellesley* single-engined long-range bomber, *Wellington* twin-engined long-range bomber, *Valentia* twin-engined troop-carrier, *Vildebeest* single-engined torpedo-bomber, and *Vincent* single-engined general purposes biplane.

At the end of 1938 the announcement was made that, in order to achieve coordination and to enlarge production facilities in keeping with the latest Air Ministry expansion program, Vickers (Aviation), Ltd., and the Supermarine Aviation Works, Ltd., were to be taken over by Vickers-Armstrongs, Ltd., the vast facilities of which will now be made more readily available for the large scale production of Vickers and Supermarine aircraft.

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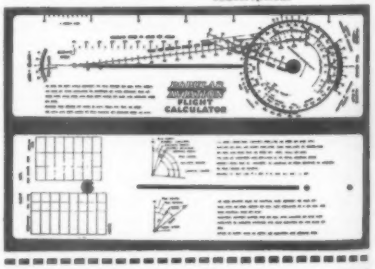

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AERONCA C-3 Seaplane 1934 licensed to August 1st Excellent condition no time since major. Navigation Lights, Aircraft battery, Compass, Anchor, Two water rudders, $995.00. Scott Redfield, Logan Field, Baltimore, Md.

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MONOCOUPE, 90 Lambert, 1935, radio, lights, starter, pants, steerable tail wheel. Sacrifice. Babb, Glendale, Calif.

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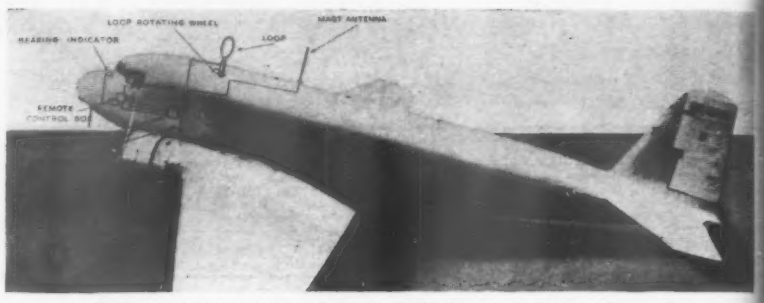

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THE constantly expanding applications of radio in aeronautics have tremendously increased the number of attractive opportunities for interesting and worthwhile employment for those who wish to make their careers in aviation. "Aeronautic Radio" supplies the information about the subject now needed by every student, mechanic, radio operator, pilot, and air transport executive. Its author, Myron F. Eddy, writes from a background of more than twenty years' experience as a naval airplane pilot, a naval radio operator, and as an instructor in aeronautic radio in U. S. Navy ground schools and in such leading commercial schools as Boeing, Curtis-Wright (Kansas City), and Stewart.

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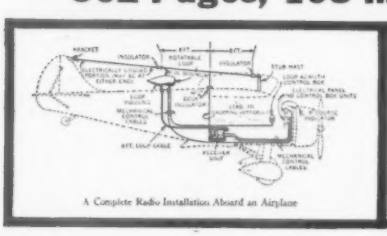

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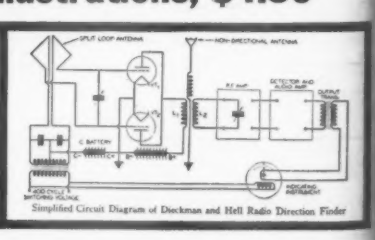

Simplified Circuit Diagram of Dieckman and Heil Radio Direction Finder